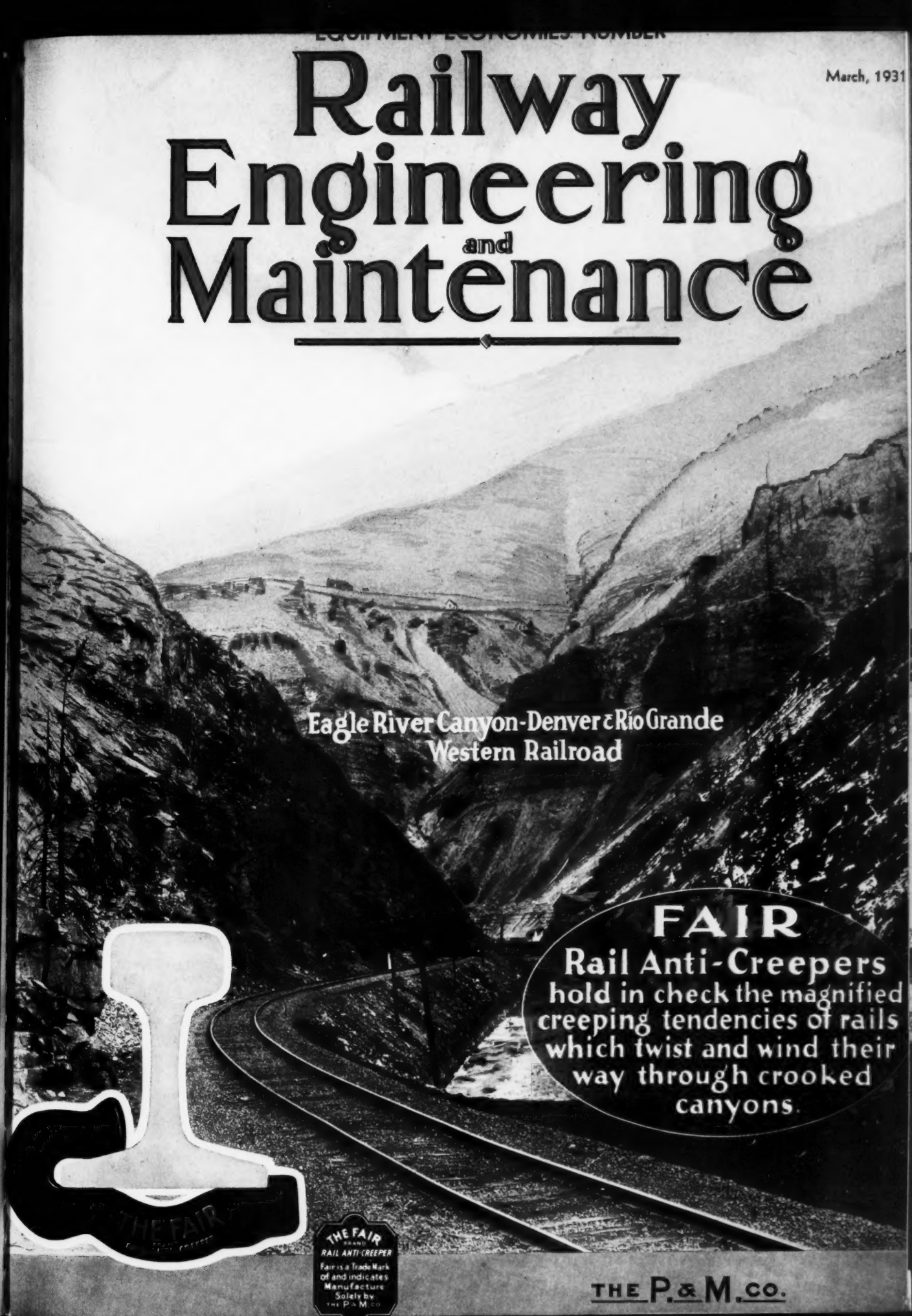
EQUIPMENT ECONOMIES NUMBER

March, 1931

Railway Engineering and Maintenance


Eagle River Canyon-Denver & Rio Grande Western Railroad
FAIR
Rail Anti-Creepers
hold in check the magnified creeping tendencies of rails which twist and wind their way through crooked canyons.
THE FAIR
THE FAIR BRAND RAIL ANTI-CREEPER
Fair is a Trade Mark of and indicates Manufacture Solely by THE P & M CO.
THE P. & M. CO.

Where maintenance *is difficult*

HY-CROME is of greatest value

CHOOSE a stretch of track which causes the most trouble, the *toughest* stretch you can find. Apply HY-CROME spring washers on the rail joints—and watch periodic maintenance inspections grow less frequent.

HY-CROME is made not only for the specific purpose of maintaining rail joint rigidity, but is the most economical means of keeping track bolts tight and under proper tension with adequate compensation for wear. Its action is automatic, non-fatiguing, permanent. It needs no replacement.

Compensation for wear and bolt stretch depends entirely upon the useful range of spring power inherent in a helical spring washer. And the greatest reactive pressure over a wide range possessed by any track washer belongs to HY-CROME. That is why HY-CROME is specified so generally.

THE
RELIANCE MANUFACTURING CO.
MASSILLON, OHIO
Engineering Materials, Ltd., McGill Bldg.
Montreal, Quebec, Canada

HY-CROME

Reg. U. S. Pat. Office

RAILWAY ENGINEERING AND MAINTENANCE

Published monthly by Simmons-Boardman Publishing Co., at 2200 Port Washington Road, Milwaukee, Wisconsin. Subscription price: United States, Canada and Mexico, $2.00; foreign countries, $3.00 a year. Single copy, 35 cents. Entered as second class matter February 14, 1931, at the postoffice at Milwaukee, Wisconsin, under the Act of March 3, 1879.

Alphabeticcal Index to Advertisers, Page 314 Classified Index to Advertisers, 310-312

STOP

at

Space 89

National Railway Appliance Association Exhibit

The LUNDIE TIE PLATE answers one of the major problems of present day track maintenance without the heavy expense involved in making radical changes in present construction methods.

LUNDIE TIE PLATES lend themselves ideally to fastening to the ties with either lag screws or spikes independent of the spikes that hold the rail. A further refinement is thus added to a tried and proven track design for merely the extra cost of either lag screws or additional spikes.

The LUNDIE TIE PLATE offers a design that eliminates tie destroying projections and is not encumbered with any attachments.

The Lundie Engineering Corporation
285 Madison Ave., New York
59 East Van Buren St., Chicago

LUNDIE TIE PLATE

"CRAIGELLACHIE!"

AND THE CANADIAN PACIFIC STOOD FAST

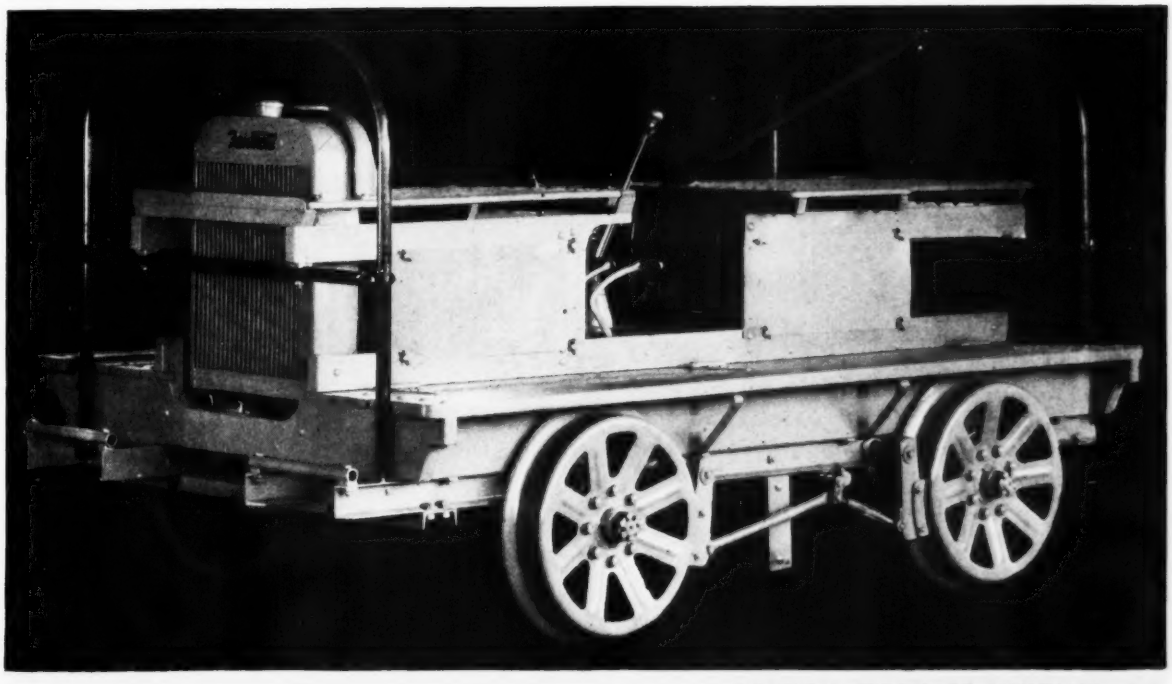
Fifty years ago a little group of men undertook a project which a Dominion Government had tried and given up—the building of a transcontinental railroad. Five years fighting tremendous physical difficulties used up their cash resources. No help was in sight—the very future of Canada as a nation hung in the balance.

Then, at the blackest moment, there was cabled from England the cryptic word "Craigellachie"—*stand fast!* At this word from their president, Lord Mount Stephen—the men at their wits end in Canada stood fast, gained the new hope that turned the tide...on November 7, 1885, they silently gathered in the morning mists at a little British Columbia station to see the driving of the Golden Spike, which completed the line of steel from Atlantic to Pacific. A line of steel that made the Canadian Confederation an accomplished fact. A line of steel that today has grown to include vast hotel, express and telegraph systems, and palatial liners riding the oceans.

Number 3 of a Series Contributed by Leading Railroads

Photography has made permanent the driving of the Golden Spike by Lord Strathcona, in 1885

THE RAILROAD WORLD



FAIRMONT A6 FOUR-SPEED HEAVY DUTY CAR

The A6 is powered by the standard, Ford Model A 40 H. P. engine and uses the new Ford "AA" four-speed truck transmision.

Other features include: Center control cockpit . . . and final reverse gear which allows four speeds either way with full engine efficiency.

"EMPIRE Builders!"—Roosevelt called them—those early men who faced every conceivable hardship to weld their country together with a track of steel. The ring of their hammers on the Golden Spikes has echoed through history—an ever-present inspiration for those who serve today.

This spirit is reflected in the nation-wide Fairmont organization . . . to build the best that is humanly possible . . . to give the most complete cooperation possible . . . to make every railroad's investment in Fairmont cars *the lowest in over-all cost of service.* The proof . . . *over half the motor cars now in service are Fairmont products.*

Fairmont Mudge

Performance on the Job Counts

FAIRMONT RAILWAY MOTORS, INC.
FAIRMONT, MINNESOTA, U. S. A.
General Sales Offices: 1356 Railway Exchange Bldg., CHICAGO

District Sales Offices:
New York City Washington, D. C. St. Louis
San Francisco New Orleans

FAIRMONT RAILWAY MOTORS, Ltd., Toronto, Canada
Foreign Representative: THE BALDWIN LOCOMOTIVE WORKS

Manufacturers of section motor cars, inspection motor cars, gang and power cars, weed burners, mowers, ballast discers, ball and roller bearing engines, push cars and trailers, roller axle bearings, wheels, axles and safety appliances.

K N O W S F A I R M O N T

. . . WHERE RED SIGNALS SAFETY . . .

THE engineer or maintenance man recognizes as a signal of safety the pure red-lead paint coating which covers every joint and surface of the iron and steel structures in his charge.

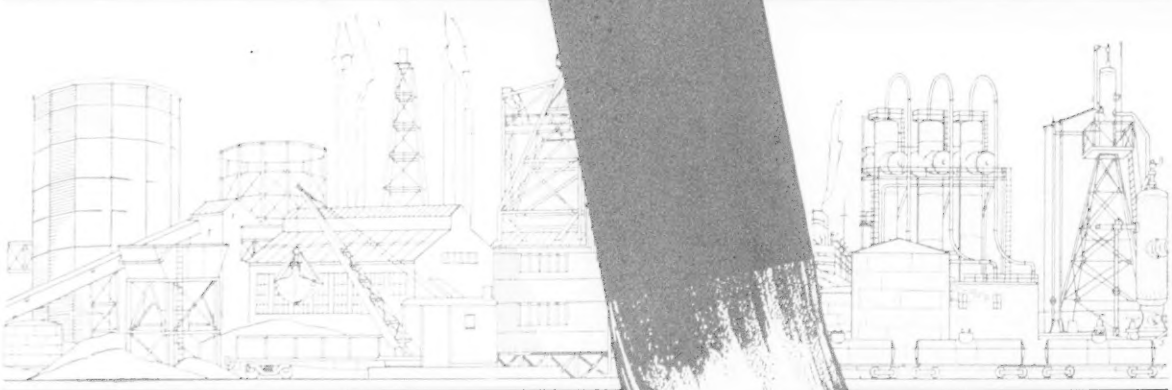
Dutch Boy Red-Lead safeguards iron and steel against the destructive forces which, if left unchecked, turn valuable metal structures into mountains of rust. Dutch Boy Red-Lead seals out corrosion . . . seals out rust . . . seals out the moisture and gases that are constantly attacking exposed metal.

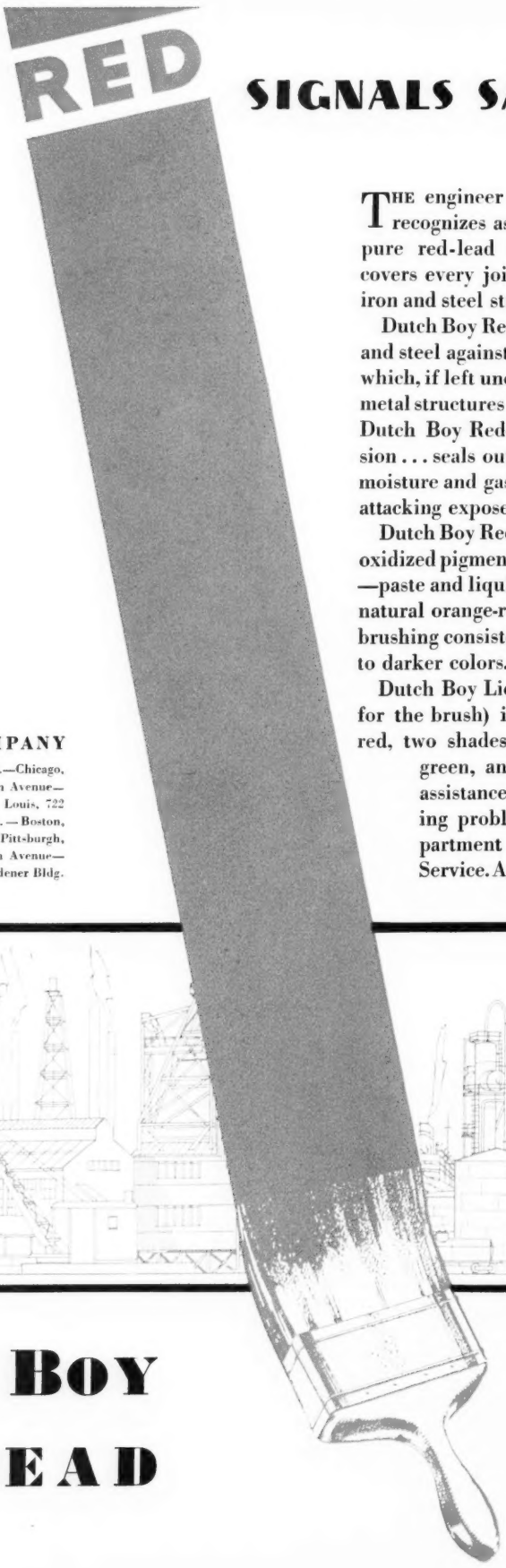
Dutch Boy Red-Lead is a fine, highly oxidized pigment supplied in two forms —paste and liquid. The paste comes in natural orange-red, is readily mixed to brushing consistency and can be tinted to darker colors.

Dutch Boy Liquid Red-Lead (ready for the brush) is available in orange-red, two shades each of brown and green, and also in black. For assistance in your metal painting problems, write to our Department of Technical Paint Service. Address nearest branch.

NATIONAL LEAD COMPANY

New York, 111 Broadway—Buffalo, 116 Oak St.—Chicago, 900 West 18th St.—Cincinnati, 659 Freeman Avenue—Cleveland, 820 West Superior Avenue—St. Louis, 722 Chestnut St.—San Francisco, 2240 24th St.—Boston, National-Boston Lead Co., 800 Albany St.—Pittsburgh, National Lead & Oil Co. of Pa., 316 Fourth Avenue—Philadelphia, John T. Lewis & Bros. Co., Widener Bldg.





DUTCH BOY RED-LEAD

NORTHWEST

Crawler Equipment

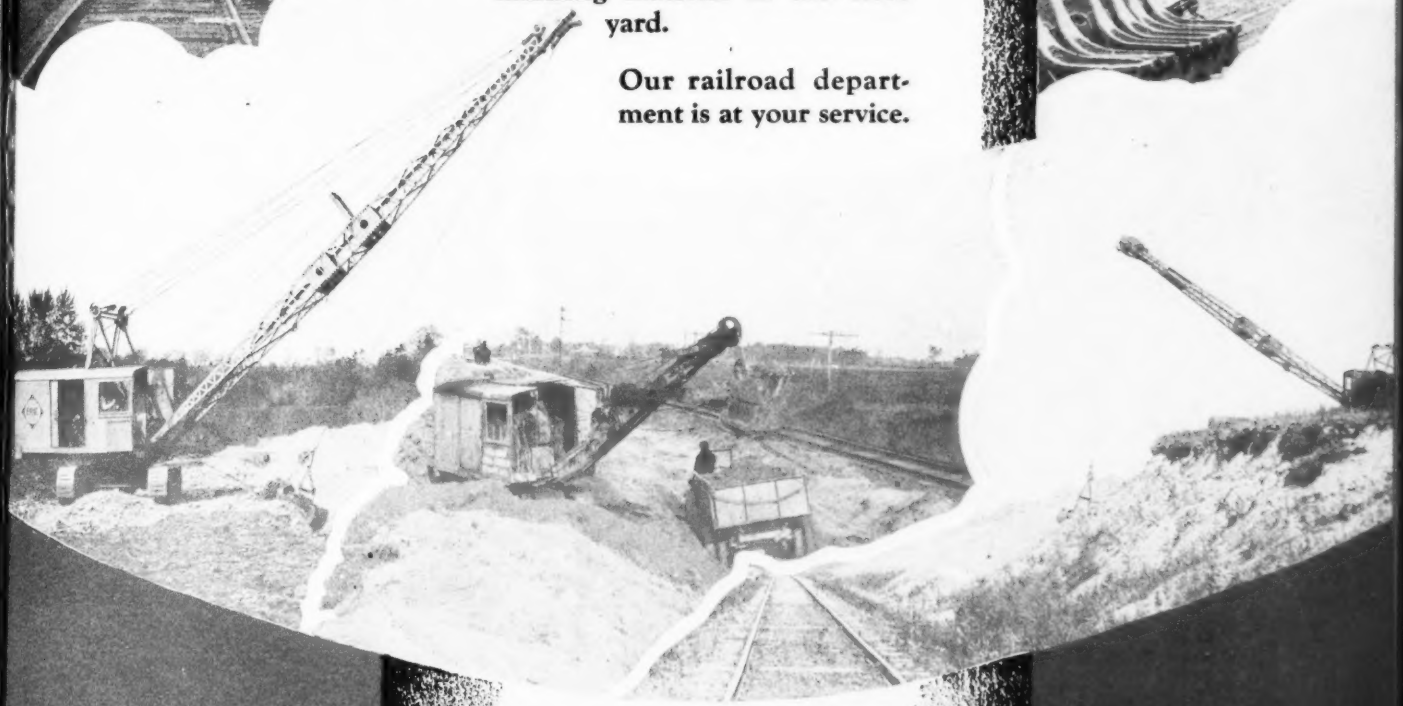
is endorsed by the country's leading railroads!

CRANES
SHOVELS
DRAGLINES
PULLSHOVELS
SKIMMER-SCOOPS

Built in Seven Sizes, from ½ to 2 cu. yd. capacities

NORTHWEST machines are being used for all classes of railway work, from ditching to handling material in the store yard.

Our railroad department is at your service.



NORTHWEST

40% of the Crawlers on American Railroads are Northwests

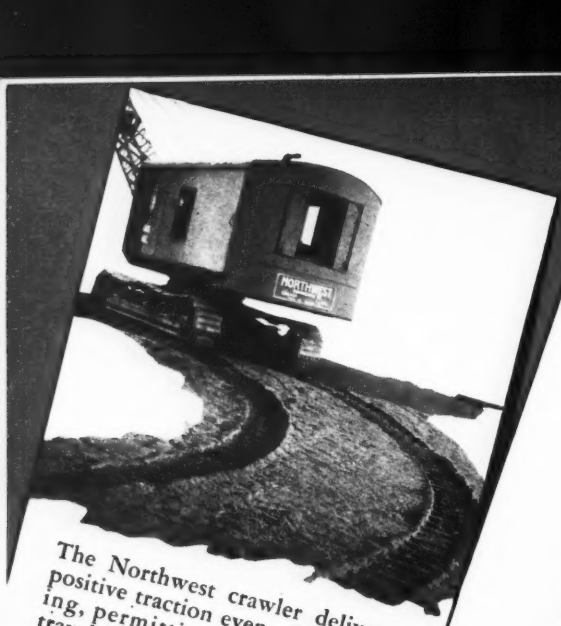
A combination of features no other railway crane or shovel has to offer!

NORTHWEST

NORTHWEST ENGINEERING COMPANY

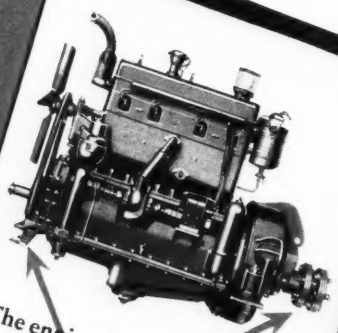
The world's largest exclusive builders of gasoline, oil burning and electric powered shovels, cranes and draglines

1713 Steger Building, 28 East Jackson Boulevard
Chicago, Illinois, U. S. A.



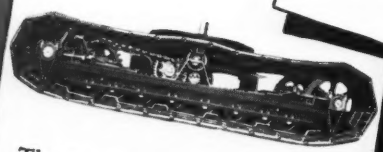
The Northwest crawler delivers positive traction even while turning, permitting rapid and easy travel from car to car, down ramps and over ground conditions impossible for the ordinary crawler.

All high speed shafts roll on roller bearings eliminating the power waste that comes with bronze and babbitt.

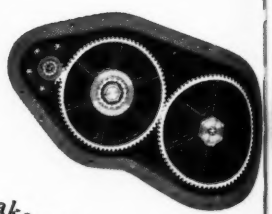


The engine is mounted on elliptical springs and drives through a flexible coupling eliminating the dangers of misalignment and damaging vibration.

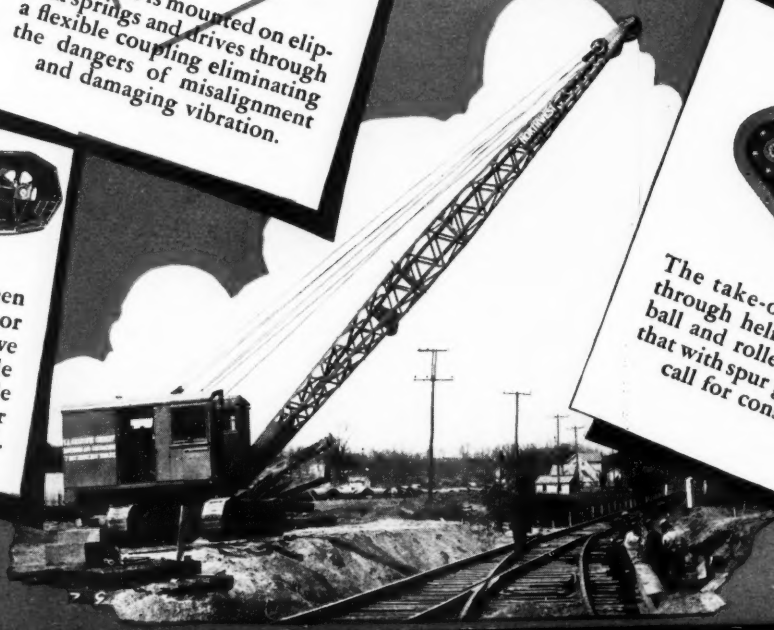
The "feather-touch" control is the only one in which the action of the clutch is in direct proportion to the movement of the lever. It speeds up operation increasing the output 25%.



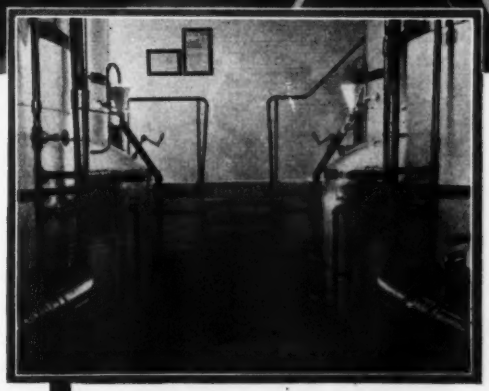
There are no openings between treads to pick up materials or catch on rails. Small rollers give shoes a firm support and single sprockets permit a full flexible action which will fit the crawler belt to the contour of the ground.



The take-off from the motor is through helical gears mounted on ball and roller bearings. Compare that with spur gears, and chains that call for constant adjustment.



EFFICIENCY



Double installation of Oxweld 500-pound Duplex Balanced Seal Acetylene Generators in Standard Oxweld Railroad Service building.

By providing the best instruction, supervision, apparatus, and materials, Oxweld Railroad Service insures utmost efficiency in railroad oxwelding and cutting operations.

For example, Oxweld Railroad Service Engineers know that, despite training in every phase of welding and cutting, an operator can do efficient work only when he has a dependable, steady gas supply. They make thorough studies of present and probable future requirements and without capital investment by the railroad construct or install acetylene generating and oxygen distributing equipment, including generator and cylinder storage houses and oxwelded piping systems to deliver welding gases to the operating stations. The operator, freed from possibility of interruption, can concentrate on the job.

Oxweld Railroad Service overlooks nothing conducive to efficient application of the oxy-acetylene process to railroad work. That is why the majority of Class I roads contract for it year after year.

OXWELD RAILROAD SERVICE

THE OXWELD RAILROAD SERVICE COMPANY

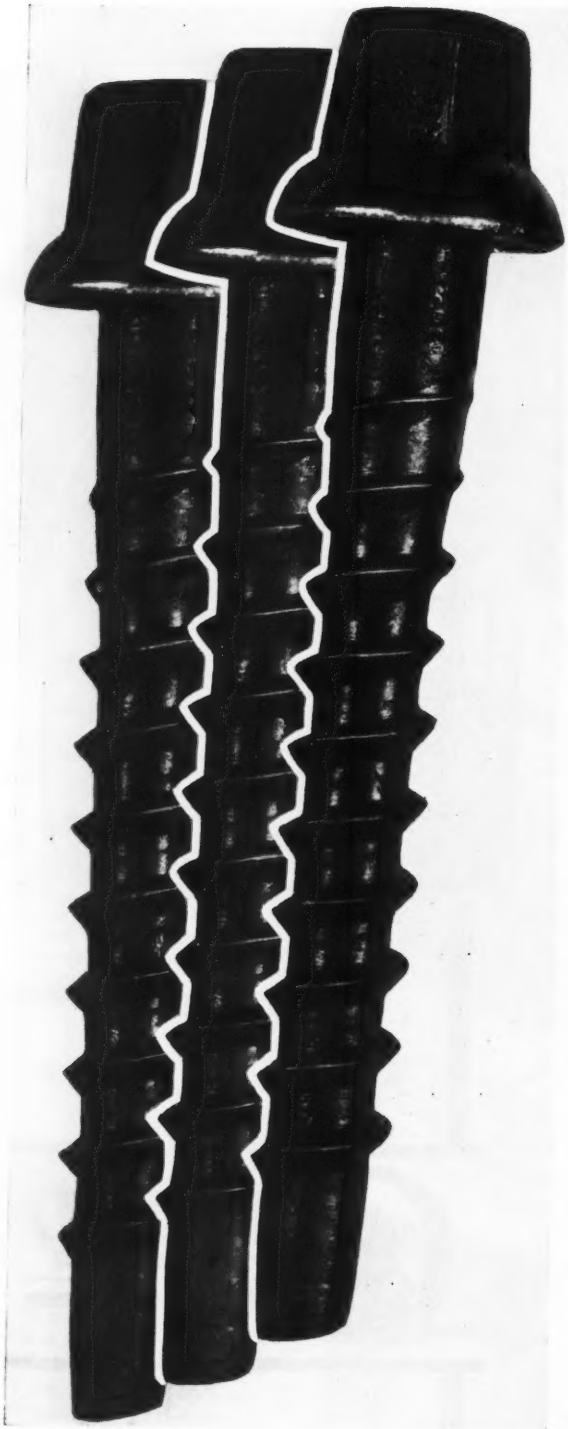
Unit of Union Carbide and Carbon Corporation

UCC

NEW YORK
Carbide and Carbon Bldg.

CHICAGO
Carbide and Carbon Bldg.

BETHLEHEM TIE PLATE SCREW SPIKES



Bethlehem Tie Plate Screw Spikes offer a more secure and better method of building track. They have great holding power and lateral stiffness, and by their use the destructive effect on the fibre of the timber due to driving ordinary spikes is avoided.

Because they hold the tie plate more securely, virtually eliminating all movement of the tie plate against the tie, Bethlehem Tie Plate Screw Spikes substantially lessen wear and tear on ties, and prolong their life. In fact, the records of one railroad that is a large user of Bethlehem Tie Plate Screw Spikes indicate that their tie renewals have been reduced by approximately one half.

Bethlehem Tie Plate Screw Spikes are uniform and accurate in all dimensions, and have a standard threadline throughout. A feature that demands special emphasis is the pilot point. It allows the Bethlehem Tie Plate Screw Spike to be inserted easily and quickly, and holds it erect, so that the tightening machine readily grips it and drives it home.

BETHLEHEM STEEL COMPANY
General Offices: Bethlehem, Pa.

District Offices: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Buffalo, Pittsburgh, Cleveland, Cincinnati, Detroit, Chicago, St. Louis

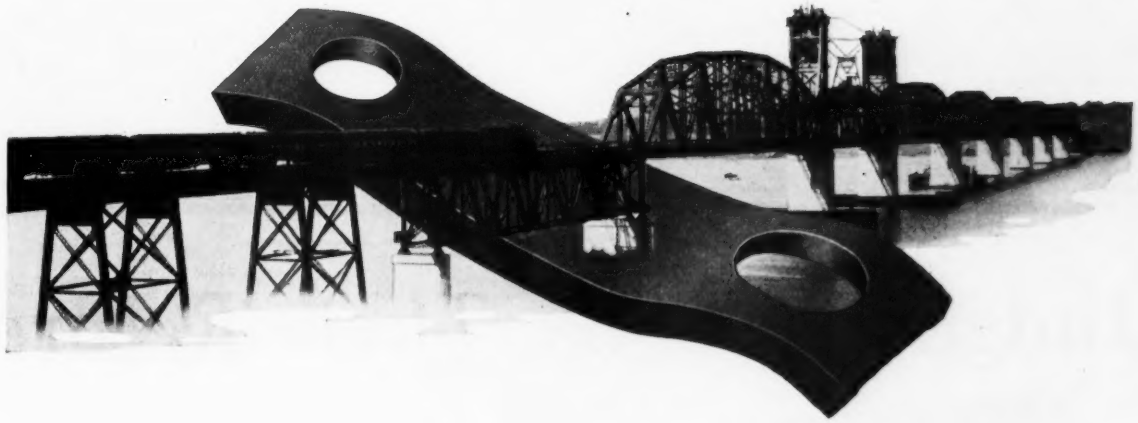
Pacific Coast Distributor: Pacific Coast Steel Corporation, San Francisco, Seattle, Los Angeles, Portland and Honolulu.

Export Distributor: Bethlehem Steel Export Corporation, 25 Broadway, New York City.

BETHLEHEM

■ Various types of Tie Plate Screw Spikes will be included in the Bethlehem exhibit at the National Railway Appliances Exhibition in the Coliseum at Chicago on March 9 to 12 inclusive, Booth No's. 69½-72.

Southern Pacific Co's New $12,000,000 Bridge



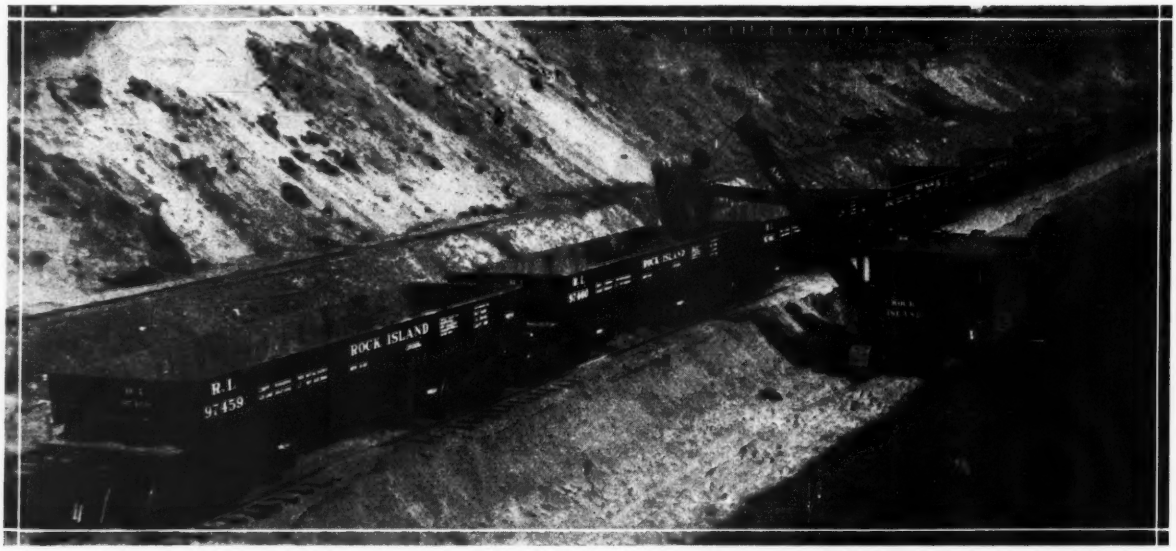
equipped with

VERONA RAIL JOINT SPRINGS

IN order to secure maximum safety at the rail joints, all track bolts are securely held at uniform tension with Verona Rail Joint Springs.

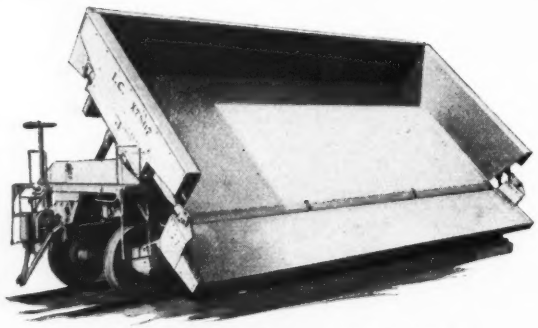
VERONA TOOL WORKS

Pittsburgh, Pa.

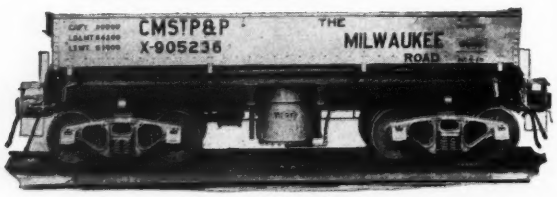


Western 30-yard Drop Door Dump Cars in Rock Island Railroad betterment work.

Judge Them By Their Record



Track and ballast completely protected in dumping.



The 20-yard car is ideal for ditching service.

It is low, compact, and ruggedly constructed.

Here is what you get when you buy Western Drop Door Air Dump Cars.

1. Absolute safety in operation under all conditions.
2. Complete protection of track and ballast when dumping.
3. Quick, clean discharge of all kinds of material.
4. Ample clearance immediately after dumping for main line traffic.
5. Low loading height permitting deeper ditching.
6. Economical operation at low air pressure and small air consumption.
7. Simple, rugged construction, with few movable parts, all easily accessible.
8. Low upkeep and freedom from repair costs.

Standard gauge cars are made in all practical sizes. For first hand information ask the men who use Western drop door dump cars. Also send for our Dump Car Catalog 81-A. There is no obligation.

WESTERN WHEELED SCRAPER COMPANY

AURORA, ILLINOIS, U. S. A.

WESTERN

Tough Digging *requires* Strength and Heft . . .

P&H DRAGLINES

The P&H Model 775, 1¾ yd. Dragline weighs 124,000 lbs. yet its ground pressure is only 9.1 lbs. per square inch. It takes weight to make a real dragline.

▲5212

It takes heavy construction for an excavator to stand the gaff. Almost any kind of light, spindly machine will produce —for a while. But for year-after-year service . . . for dragline work under all conditions . . . for profitable investment . . . you've got to have a heavily constructed machine like the P & H.

P & H Draglines are strong and heavy, to stand heavy work. Special alloy steels are employed throughout. Shafts are large. Gears are wide faced, cut from heat treated alloy steel blanks. All main frames are steel, cast in a single piece. P & H Corduroy Crawlers are the most sturdy type, built on unit-cast steel frames.

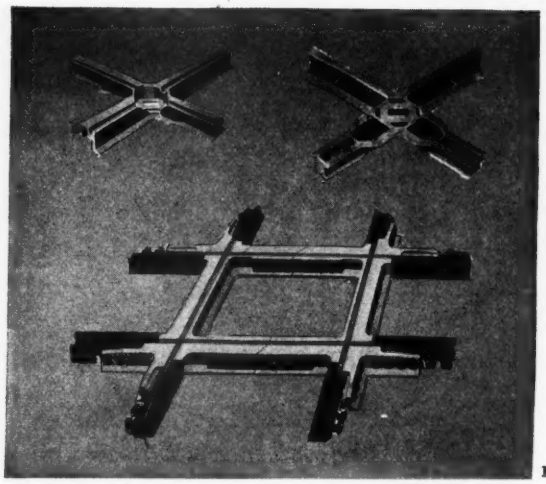
Yet because of their long, wide crawlers, the ground pressure per sq. in. of P & H Draglines is extremely small.

Safeguard your investment by depending upon the reliable P & H.

HARNISCHFEGER CORPORATION
Established 1884
4420 W. National Ave., Milwaukee, Wis.
Offices and Agents in all Principal Cities
WAREHOUSES AND SERVICE STATIONS
San Francisco, Los Angeles, Seattle, Dallas, Hoboken, Memphis, Jacksonville

SERVING . . . and SAVING

. . on over fifty leading roads . . .



Pat. No. 1591706

THE SCIENTIFICALLY DESIGNED
WHARTON CROSSING

The improved Wharton Crossing at Elizabeth, N. J.—and below, Wharton crossings at Port Teading, N. J.

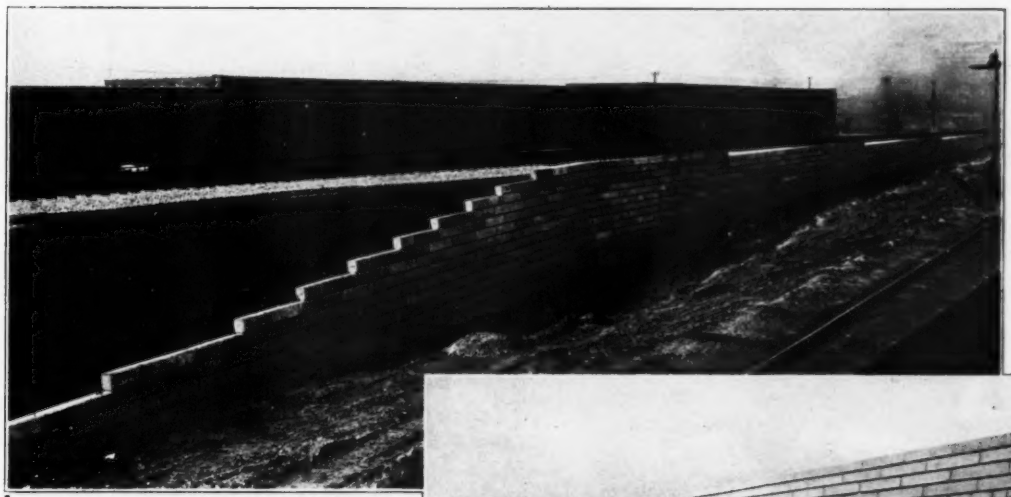
Rail Bound Frogs
Solid Manganese Steel Frogs
Self Guarded Frogs
Switches—Open Hearth and Manganese Steel Tipped
Bridge Rails
Complicated Layouts

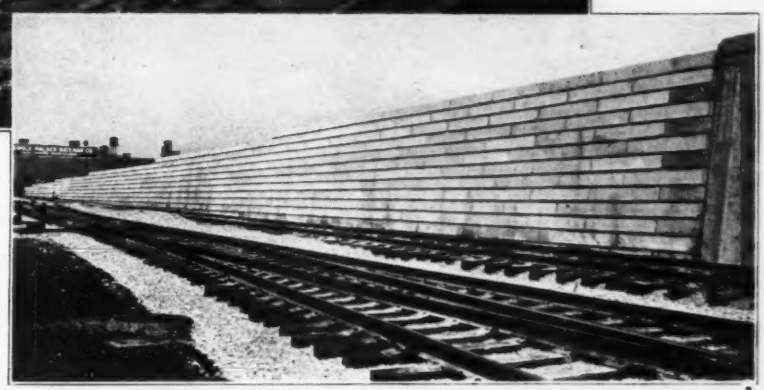
■ Scientifically designed to withstand the severest strains under modern traffic conditions — and made from dependable Tisco manganese steel to assure high strength and resistance to wear—the new Wharton Crossing is now serving *and saving* on over fifty of our leading railroads.

■ You will want to learn more about the improved Wharton design which materially lengthens crossing life, and the service this crossing is now giving on many roads. Send for complete data.

WILLIAM WHARTON JR. & CO., INC.
EASTON, PENNSYLVANIA

SALES OFFICES: CHICAGO HOUSTON MONTREAL NEW YORK
PHILADELPHIA BOSTON SAN FRANCISCO SCRANTON LOS ANGELES





Federal Retaining Walls for grade separation in Chicago, the top one for B&O tracks; the lower for joint tracks of the Burlington and North Western

Today's Choice—Due to Economies!

Retaining walls of precast concrete unit construction, *cost less to build* than a poured concrete wall—because all form work is eliminated—there is no stripping and no rubbing—no expensive foundation. And Federal 2-piece construction gives full salvage value if the wall is moved.

Compared to other cribbing systems, there are savings in labor handling *two* units instead of three or more—savings in maintenance costs, because of the *closed-face* design, characteristic of Federal.

More and more of these sturdy, permanent walls are being installed by prominent roads—many, after actual experience with them covering a period of years. Booklet gladly sent on request.

FEDERAL - AMERICAN CEMENT TILE CO.

Executive Offices: 608 South Dearborn Street . . . . . CHICAGO
Plants Near CHICAGO NEW YORK PITTSBURGH BIRMINGHAM

Concrete Products *for Over 25 Years*

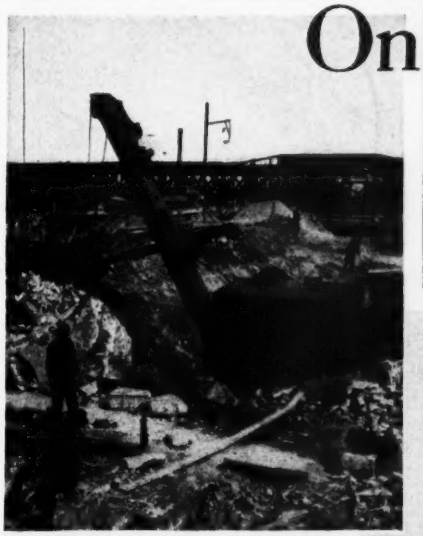
FEDERAL 2 piece Concrete CRIBBING

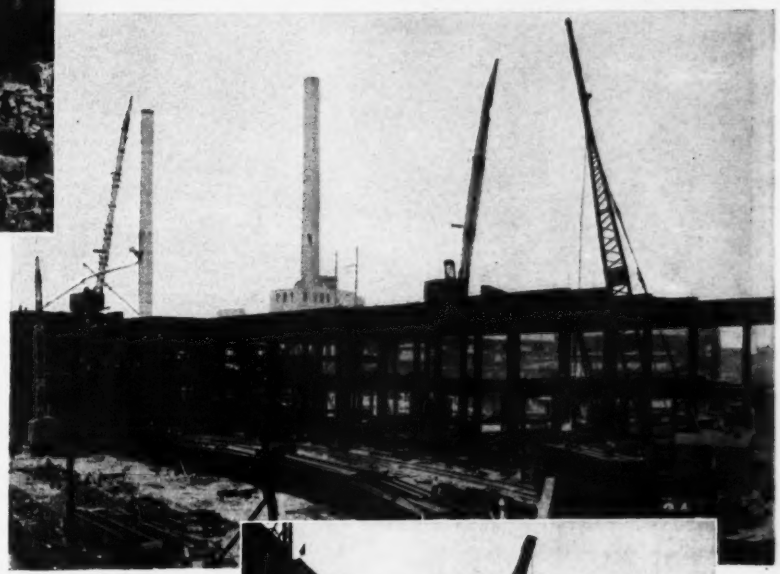
Speed and Comfort are Desirable—Safety is Essential

The Rail Joint Company

165 Broadway, New York, N. Y.

On the Pennsylvania's New Terminal ~ *at West Philadelphia*





Above — Type DC gas shovel owned by Brann & Stuart excavating for the new terminal.

Right—Several of the Industrial Brownhoists used on the steel erection by The McClintic Marshall Co.

Below — Fifteen ton Industrial Brownhoist gas crawler crane placing tubs of concrete.

ON important construction projects, where only the most dependable contractors and equipment find a place, you will see Industrial Brownhoist locomotive and crawler cranes in the thick of the work.

In building the new terminal for the Pennsylvania Railroad at West Philadelphia, for example, several contractors used Industrial Brownhoists for excavating, placing forms, driving piles and for erecting the steel. Twelve of these locomotive and crawler cranes were in use at one time.

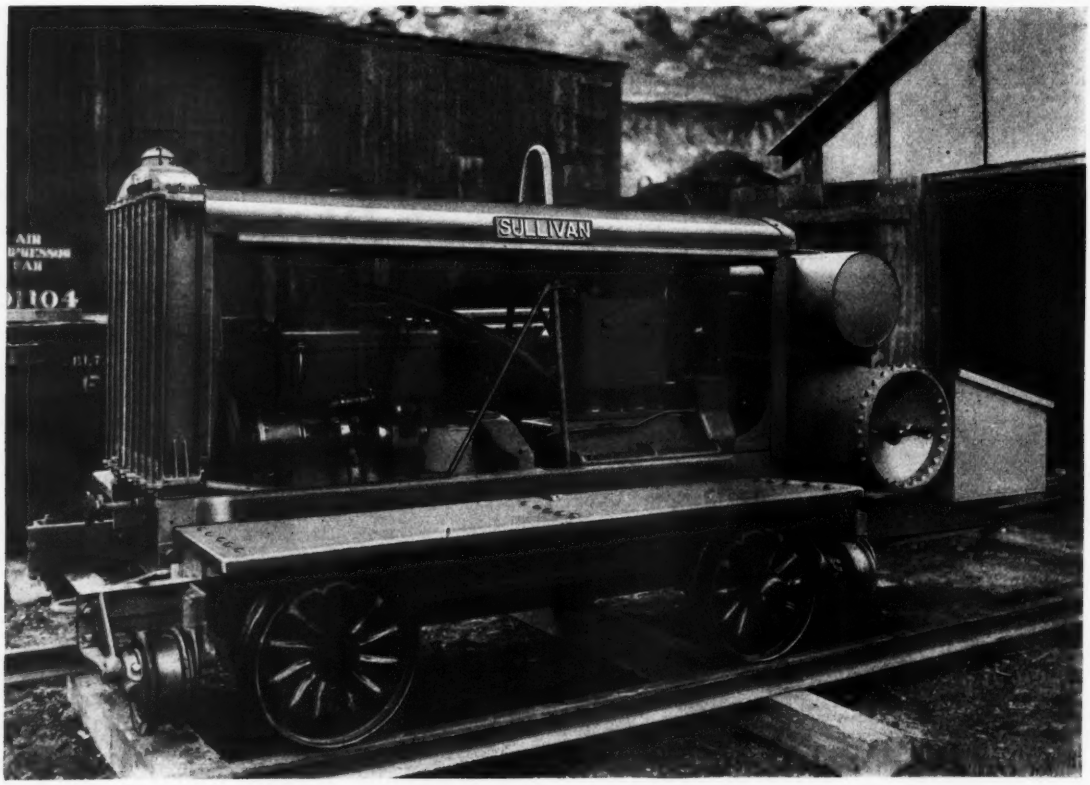
Because they move materials at lowest cost, leaders of American industry have bought thousands more Industrial Brownhoists than any other make of crane. If that kind of handling service interests you, we will gladly give you complete information on the right size and type of crane to meet your conditions.

Industrial Brownhoist Corporation, General Offices, Cleveland, Ohio

District Offices: New York, Philadelphia, Pittsburgh, Detroit, Chicago, New Orleans, San Francisco, Cleveland.

Plants: Brownhoist Division, Cleveland; Industrial Division, Bay City, Michigan; Elyria Foundry Division, Elyria, Ohio.

INDUSTRIAL BROWNHOIST



Announcing the *Vibrationless* Railway Compressor

So wide has been the acceptance of Vibrationless Compressors in the construction industry—that Sullivan Engineers have now produced this dependable machine in a railway model.

Four sizes are available. Expressed in tie-tamper capacity 4-tool, 8-tool, 8 to 12-tool and 16-tool.

Railway men will be interested in the exact running balance of these compressors. An extra fly wheel, and in the larger sizes the use of 4 paired "V" cylinders, with weight-compensation of working parts renders Sullivan Compressors **Vibrationless.**

Buda gasoline engines, direct connected provide dependable power. Substantial steel under frame and roller bearing running gear secure long life and safe moving at high speeds.

Unloading wheels have separate eccentrics and locking pawls—Lifting bail requires no slings or chains.

A Sullivan Portable Turbinair Hoist (1000 lb. capacity) can be mounted on the unit if desired.

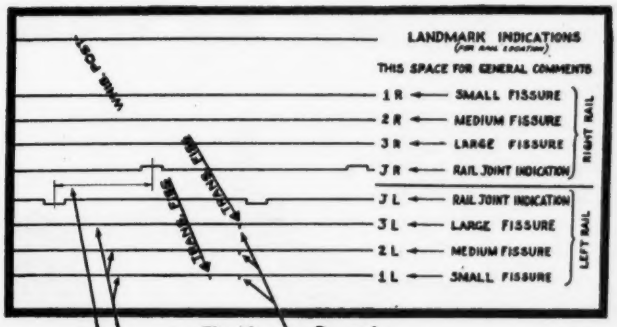
Send for Booklet 83-V.

SULLIVAN

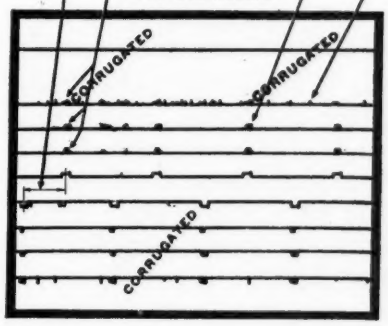
SULLIVAN MACHINERY COMPANY

708 Wrigley Bldg., Chicago **30 Church St., New York**

GREATER ACCURACY in Rail Testing *with this* IMPROVED RECORD TAPE



The New Record



The Old Record

THE research and experimental work which preceded the final perfecting of the first Sperry Detector Car is still being carried on. Simplification, improvements in equipment and an even higher degree of accuracy are constantly being sought.

Recent developments in the Sperry Laboratory have resulted in a greatly improved record tape with which each Detector Car of the Sperry Fleet is now equipped. Increased accuracy in testing results for the following reasons:

1. **LARGER SCALE AND FINER LINES** (1/16" = 1') — permit separate indications where defects are close together, greatly clarifying the record.
2. **JOINT INDICATIONS**—are now automatically eliminated in the new record, further simplifying the record.
3. **FISSURES CLOSE TO JOINTS**—The chance of confusion is removed because indications are now clearly shown separately from joint indications.
4. **WHEELBURNS, CORRUGATIONS,** etc., of a minor nature are now eliminated from the record. Large defects are easily recognized and marked so on the record.

Constant improvements, of which the new record tape is a typical example, are being incorporated in Sperry Detector Cars right along. This procedure is an assurance to railroads of more accurate results from tests by Sperry Rail Service. It is an advantage made economically possible by the contract basis on which all Sperry tests are conducted.

A Typical Corrugated Rail

A Typical Wheel Burn

SPERRY RAIL SERVICE

SPERRY PRODUCTS, INC.

Sperry Building, Manhattan Bridge Plaza, Brooklyn, N. Y.

Chicago Office: 80 East Jackson Blvd.

KREOLITE

We Distill Our Own Creosote Oil

By so doing it is possible for us to insure to the purchaser a uniform pure product of any grade desired. We have treated hundreds of millions of feet of timber in the past 17 years without a single instance of decay.

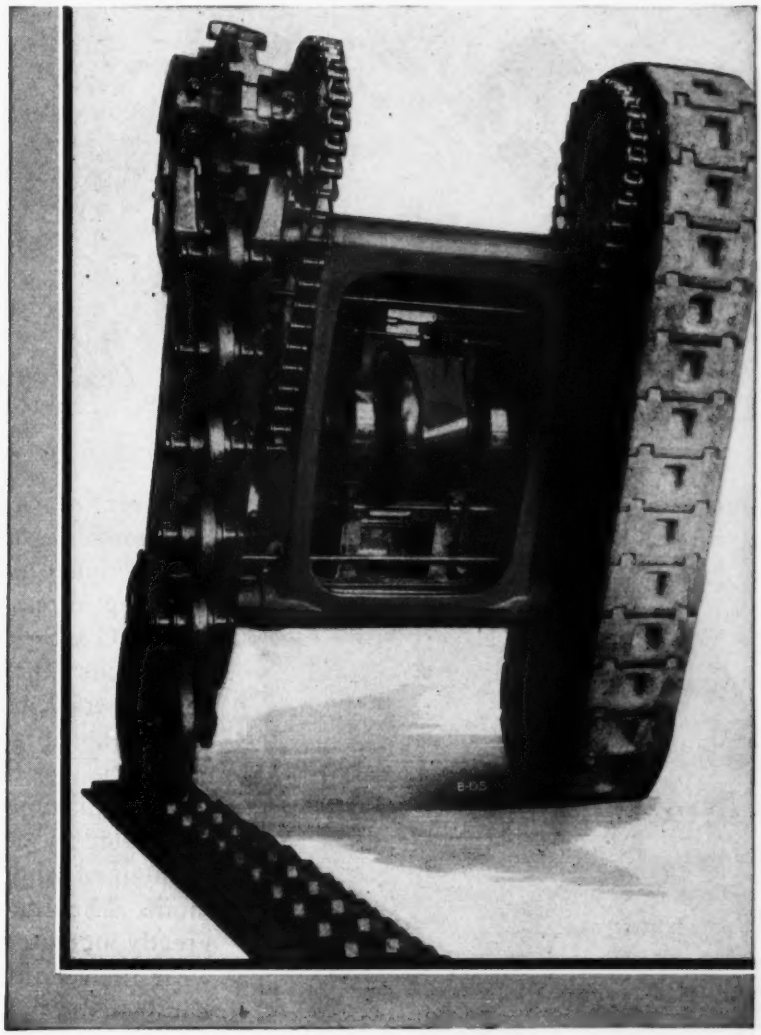
By the installation of the latest and most modern framing and boring machinery, we assure the purchaser of timbers most accurately framed at lowest cost.

Enormous stocks of Cross Ties, Switch Ties, Structural Timbers and Piling, in all sizes, in Solid Oak or Pine, properly sticked and air seasoned before treatment, available for prompt shipment from Toledo, Ohio, or our Midland Creosoting Company plant at Granite City, Ill., (East St. Louis).

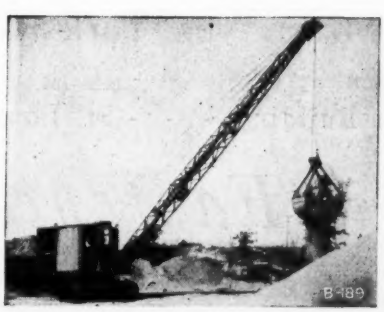
THE JENNISON-WRIGHT COMPANY, TOLEDO, OHIO

Branches in All Large Cities

R.R. TIES



ONLY simple rugged construction throughout can make a satisfactory crane. Look at the bottom view of this mounting. Its simplicity and strength are typical of Bucyrus-Erie construction.



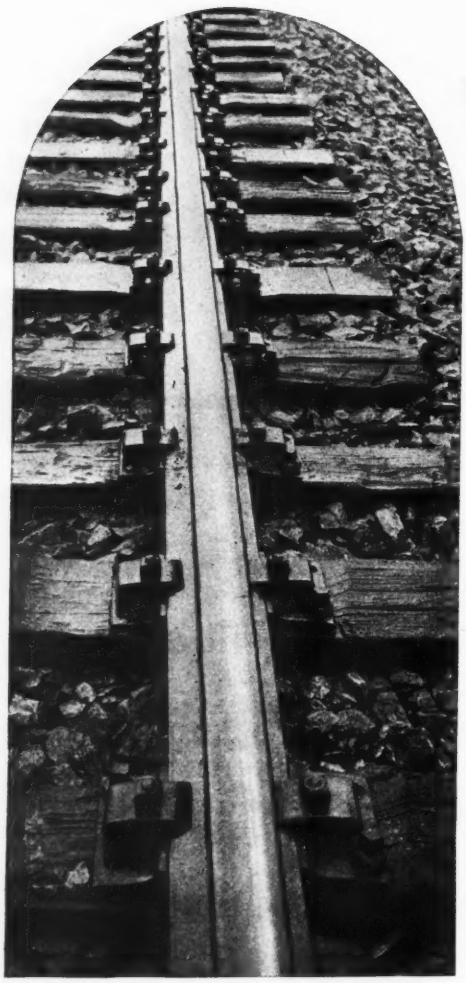
A-254

BUCYRUS ERIE

BUCYRUS-ERIE COMPANY
South Milwaukee, Wis.
Offices or distributors in principal cities

Exhibited at the March Convention
Booths 120-139

Assuring Large Reductions in Maintenance Costs



A typical installation

THE ever increasing weight and speed of modern equipment has made it necessary for *Maintenance of Way Officials* to look ahead and prepare a road bed that will keep abreast with the trend of transportation.

The Q & C—M & L Tie Plate is the result of continuous experimenting to develop the strongest possible track with the best riding qualities, with considerably higher standards in both economy and efficiency over the present day methods.

With this type track construction cut spikes are eliminated; a positive track gauge can be easily maintained, and rail creepage is reduced to a minimum. The life of both the rails and the ties is greatly increased due to the fact that mechanical wear between these members has been practically eliminated.

With the Q & C—M & L Tie Plate, a resilient track, which produces smooth riding, is assured at all times, and the heavy maintenance charges of today are greatly reduced.

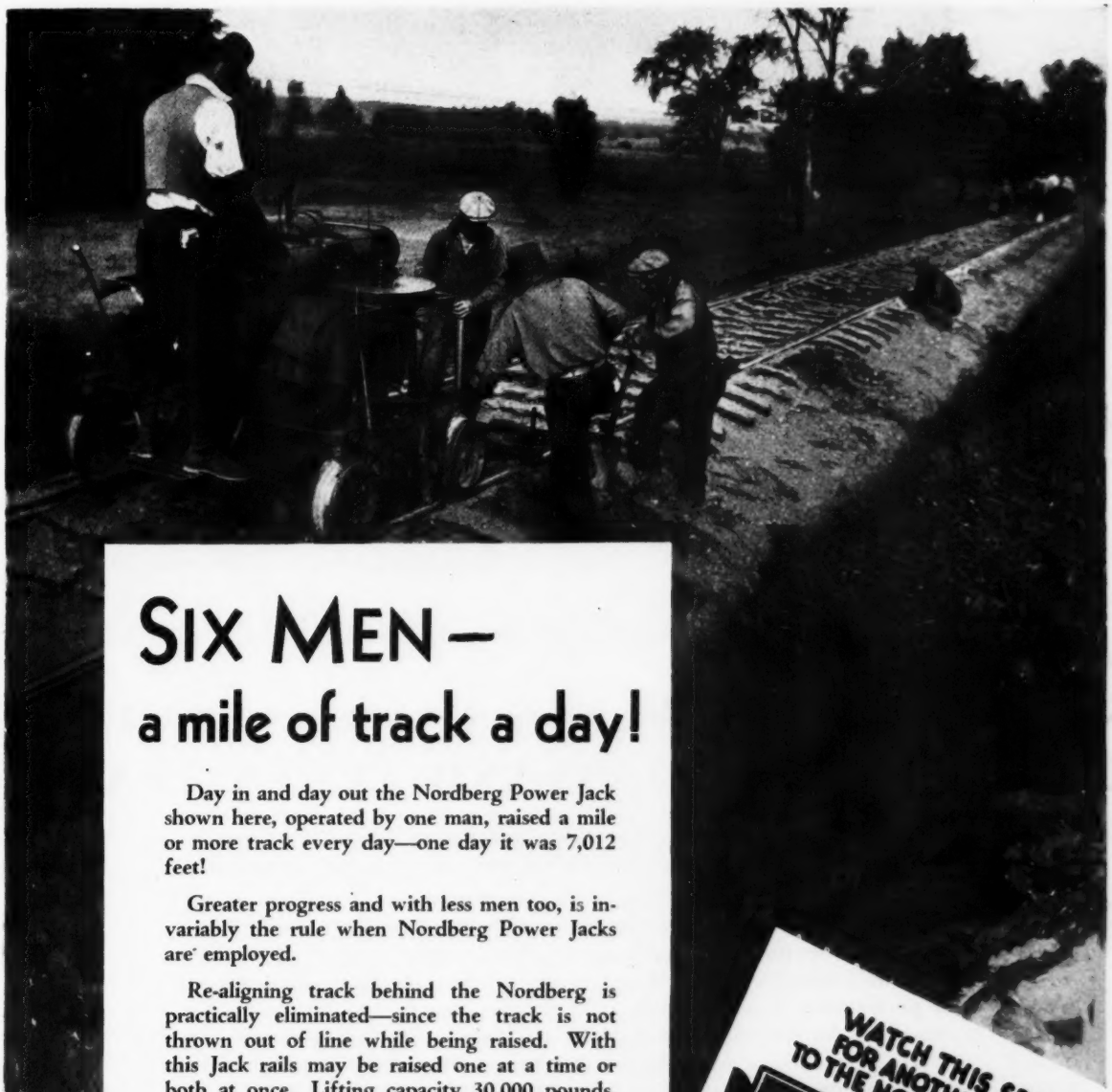
The Q & C—M & L Tie Plate has demonstrated its ability to withstand heavy and severe traffic under all climatic conditions. Our engineering department will be glad to furnish full information covering present installations.

THE Q & C COMPANY

90 West Street, New York

59 East Van Buren Street - - - Chicago
R'w'y Exchange Building - - - St. Louis

The Q & C Tie Plate Rail Fastener M & L Type



SIX MEN—
a mile of track a day!

Day in and day out the Nordberg Power Jack shown here, operated by one man, raised a mile or more track every day—one day it was 7,012 feet!

Greater progress and with less men too, is invariably the rule when Nordberg Power Jacks are employed.

Re-aligning track behind the Nordberg is practically eliminated—since the track is not thrown out of line while being raised. With this Jack rails may be raised one at a time or both at once. Lifting capacity 30,000 pounds.

Because of the economies that must be effected in this year's maintenance work, it will pay you to use the Nordberg Power Jack for your ballasting work.

NORDBERG MFG. CO.
Milwaukee, Wis.

WATCH THIS SPACE FOR ANOTHER ADDITION TO THE NORDBERG LINE

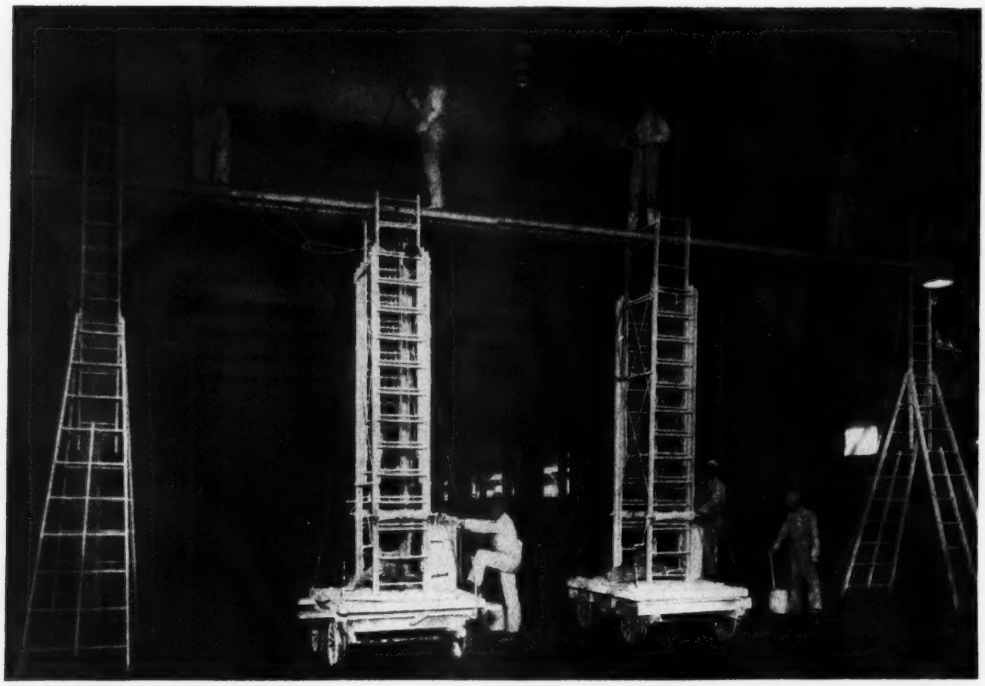
NORDBERG

Nordberg Power Rail Drill

Nordberg Track Shifter

Nordberg Power Spike Puller

Nordberg Adzing Machine



Why the CLEVELAND UNION TERMINAL USED MEDUSA PORTLAND CEMENT PAINT

IF YOU were to visit the new Cleveland Union Terminal's baggage, express and mail rooms, taxicab stand and track level, you would find all concrete surfaces clean, bright and well painted.

◆ The engineers on the Terminal selected Medusa Portland Cement Paint for this job because investigation proved that it was the only type of paint that would beautify the concrete surfaces, increase the light diffusion and be permanent. It was the only type of paint that was unaffected by the action of the elements, would resist the chemical action of lime and alkalies without peeling, scaling or dusting off. It was found to be particularly advantageous in painting inside and outside surfaces, since it has pronounced damp-proofing qualities. It was available in white and six colors. And finally, it was the only type of paint that could be used directly on damp surfaces, making it particularly desirable for decorating fresh concrete or masonry without waiting until the wall had dried out.

◆ If you are interested in economical, permanent painting of concrete or masonry surfaces, we shall be glad to send you a complimentary copy of the Medusa book "How to Paint Concrete and Masonry Surfaces." Send the coupon filled out and we shall send the book.

MEDUSA PORTLAND CEMENT COMPANY
1002 Engineers Building Cleveland, Ohio

Manufacturers of Medusa Gray Portland Cement (Plain and Waterproofed); Medusa Waterproofing (Powder or Paste); Medusa White Portland Cement (Plain and Waterproofed); Medusa Portland Cement Paint and Medusa-Mix, the Masonry Cement

MEDUSA PORTLAND CEMENT COMPANY, 1002 Engineers Building, Cleveland, Ohio

Gentlemen: Without obligation please send me a copy of the book "How to Paint Concrete and Masonry Surfaces," giving the advantages, uses and specifications for Medusa Portland Cement Paint.

Name _____ Attention of _____

Address _____

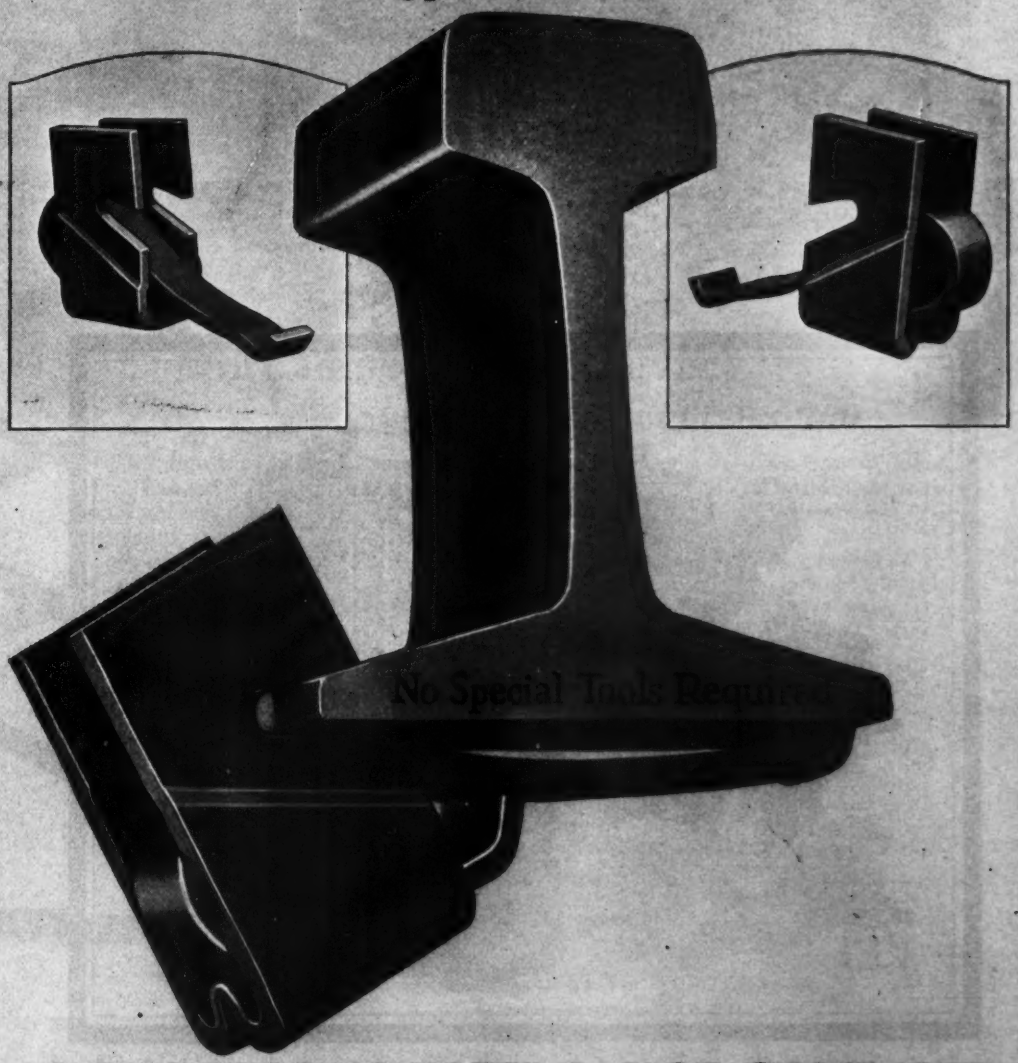
City _____ State _____

Dept. O

"STEAD"
TRUE TEMPER RAIL ANCHOR

Clamp and key are now shipped assembled which facilitates handling and simplifies application.

Initial and Application Costs Low



THE AMERICAN FORK & HOE COMPANY

General Offices: Cleveland, O. *Factory:* North Girard, Pa.

District Offices

253 Broadway, New York, N. Y.—Daily News Plaza, Chicago, Ill.

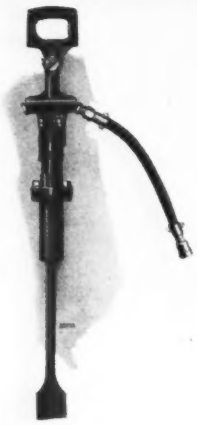
Representatives at

Boston, Denver, Detroit, Louisville, Minneapolis, St. Louis and San Francisco

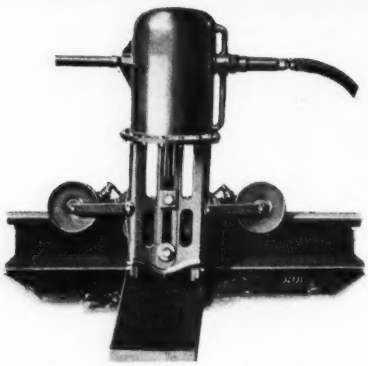
Foreign Representatives

Wonham, Inc., 44 Whitehall St., New York, N. Y., and 60-72 Windsor House, Victoria St., London, S.W.-1

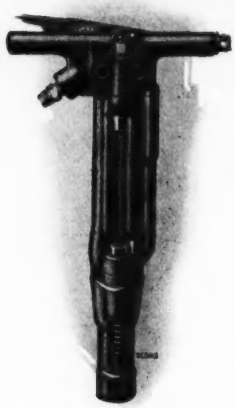
Labor Aiding Pneumatic



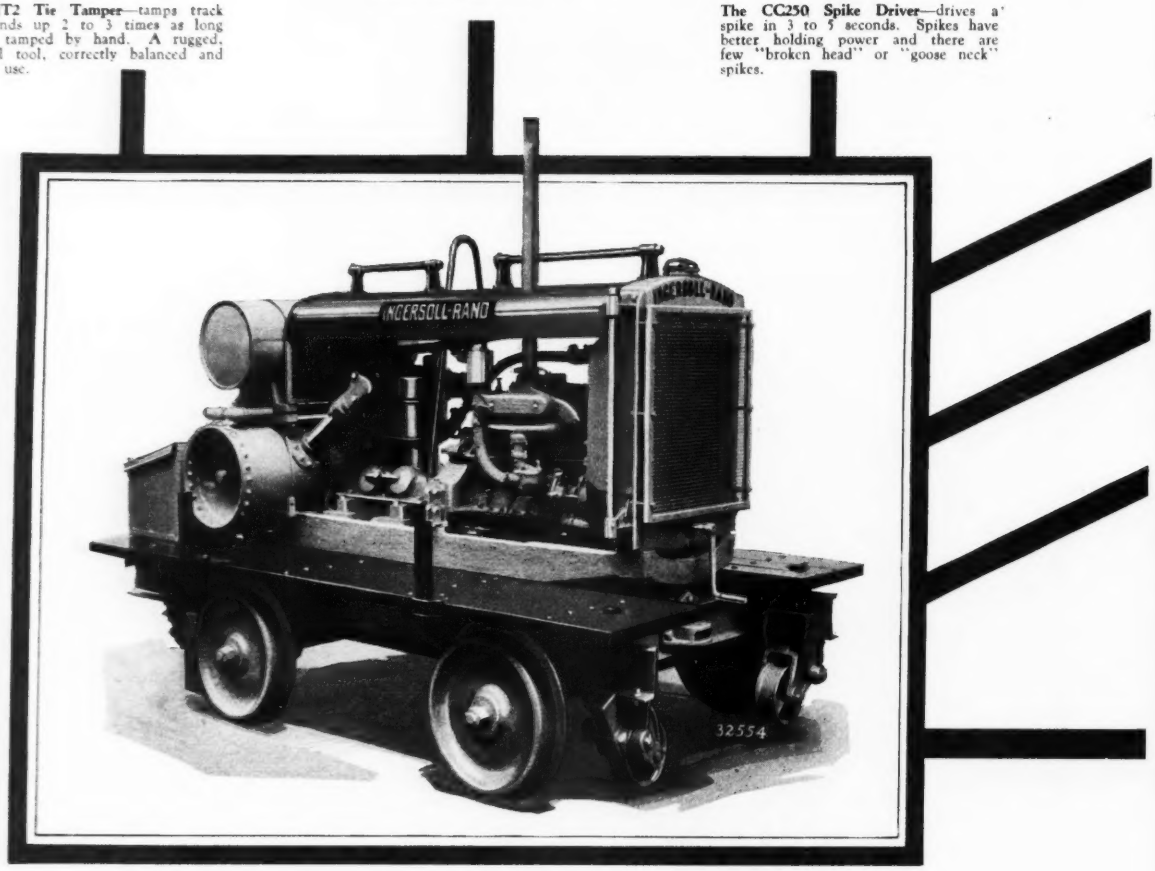
The MT2 Tie Tamper—tamps track that stands up 2 to 3 times as long as that tamped by hand. A rugged, powerful tool, correctly balanced and easy to use.



The SP9 Spike Puller—pulls spikes at the rate of 10 a minute. Pulls spikes without bending them.



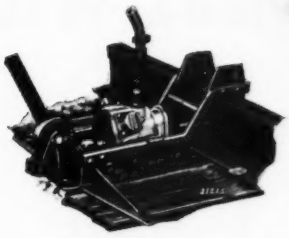
The CC250 Spike Driver—drives a spike in 3 to 5 seconds. Spikes have better holding power and there are few "broken head" or "goose neck" spikes.



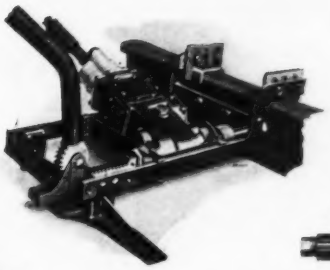
Size 5½" x 5" Tie Tamper Compressor (operates 4 Tampers). Ingersoll-Rand Compressors are available in sizes to operate 2, 4, 8, 12 and 16 Tampers. On rail laying operations and bridge and building work they supply air for a wide variety of labor-aiding tools.

Ingersoll-Rand Compressors are the result of eighteen years of experience in building compressors for the tie tamping service.

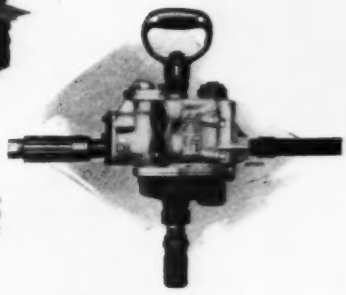
Tools for Track Work



The Size D Bonding Drill—drills a $\frac{5}{16}$" bond hole in 15 seconds. Also uses fewer drill bits than hand drilling methods.



The Size 90 Rail Drill—drills $\frac{7}{8}$" to $1\frac{1}{8}$" holes through web in 25 to 30 seconds. One man can easily handle the drill.



The CCW Wood Borer—drills a screw spike hole in 6 seconds. A money saver, too, on bridge and timber work.

More important than ever
because they save money

The increasing use of Ingersoll-Rand Tie Tamper Compressors and tools on track construction and maintenance is the result of the savings which they have demonstrated on a wide variety of operations. These pneumatic machines do the work faster and easier and in many cases make possible a much better quality of work.

In addition to the tools shown here, Ingersoll-Rand has a complete line of pneumatic hammers, rivet busters, metal drills and reamers, saws, demolition tools and rock drills. Each of these tools is a proven time and cost saver.

During the A. R. E. A. Convention be sure to visit our exhibit in the Coliseum, Booths 206-207-208-209. Ask about our new "Spottamper," and our new "Overhead Tool Carrier" for use on rail-laying operations.

INGERSOLL-RAND COMPANY 11 BROADWAY NEW YORK CITY

Branches or distributors in principal cities the world over.
For Canada Refer—Canadian Ingersoll-Rand Co., Limited,
10 Phillips Square, Montreal, Quebec.

The 99C Track Wrench—bolts up track 10 times as fast as hand methods. Will securely tighten or run off even the largest sizes of track bolt nuts.

275A-TT

Ingersoll-Rand

Millions of Tons of Freight Roll Safely and Securely Over Track Joints Made With

OLIVER TRACK BOLTS

When you think of it, a good, secure track joint bears the brunt of mighty important responsibility in railroad operation—it must bear the heavy strains of ceaseless traffic without fail—the slightest weakness in the track bolts may cause disaster and delay.

In view of its vital importance, it is significant indeed that OLIVER Track Bolts have enjoyed the confidence of the railroad industry for over half a century. Thousands—yes, millions of tons of traffic roll daily over track joints secured by OLIVER Track Bolts.

OLIVER TRACK BOLTS are double heat treated to insure ductility. They are heated to the critical or recalescent point of the steel and quenched—then re-heated to a temperature of around 1100°F and allowed to cool slowly in air.

OLIVER IRON AND STEEL CORPORATION «» PITTSBURGH

IMPORTANT

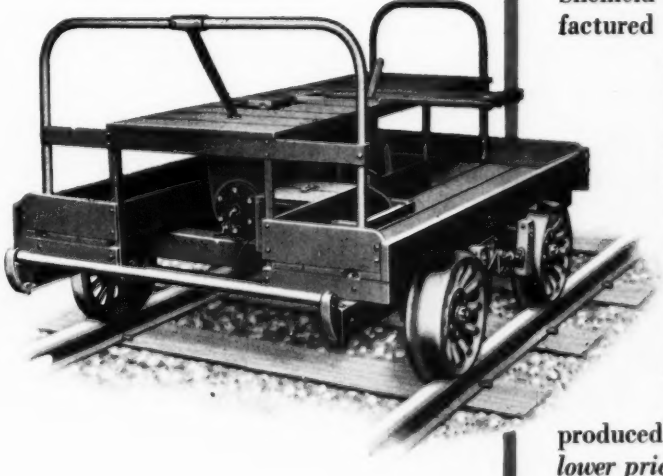
. . . to motor car users

The momentary gratification of making a cheap "buy" in motor cars is soon forgotten. The concession in price diminishes in importance when the short life of the cars, high maintenance and time loss while out of service are considered.

(*Continued on next page*)

Tapered **TIMKEN** *Roller* **BEARING**
EQUIPPED

FIRST ON THE RAILS
. . . AND STILL FIRST



"Sheffield 44-B"

THE "Sheffield" Policy

1

Sheffield cars shall be the lowest *cost* cars on the market. Therefore they cannot always be the lowest *priced.*

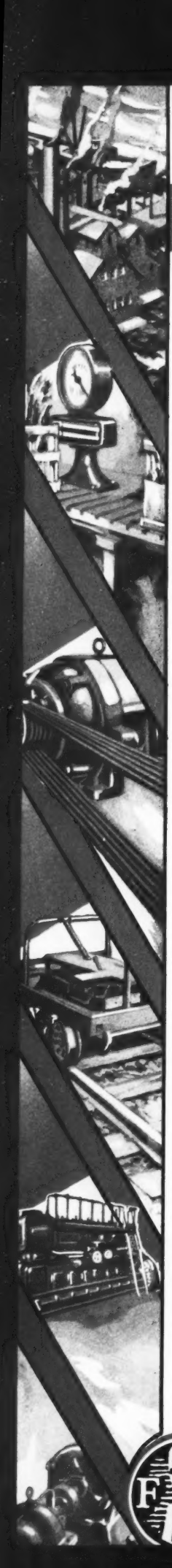
2

Sheffield cars shall be manufactured with every economy known to modern production methods. But only legitimate economies which do not impair efficiency and dependability shall be employed.

3

If a car the equal of a Sheffield is ever produced—*the Sheffield will be lower priced.*

FAIRBANKS-MORSE
MOTOR CARS

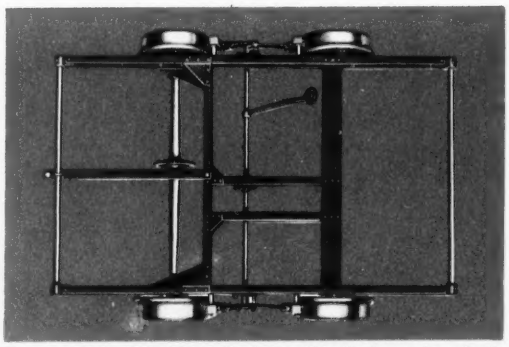


Tapered Roller
TIMKEN BEARING EQUIPPED

(Continued from preceding page)

The long dependable service that Sheffield Motor Cars give counts both in dollars and in satisfaction. Sheffield performance is the direct result of the "Policy" that was adopted 35 years ago when the first Sheffield—the first gasoline motor car on American rails—was put into service.

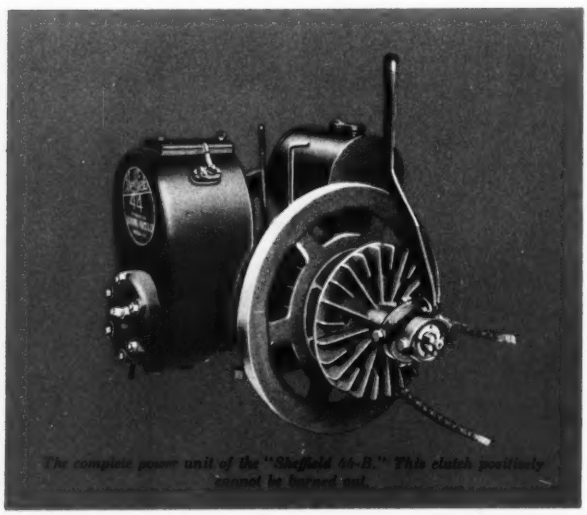
This same Sheffield Policy is rigidly followed today, backed by America's most completely equipped railway motor car manufacturing plant. While it does not permit the building of the lowest *priced* car—it does assure Sheffield purchasers of the *lowest overall cost car on the market.* Read the Sheffield "Policy." It is important to motor car users.



Top view of the "Sheffield 44-B" frame. Note the heavy channels die pressed from special frame steel and the reinforcing gusset plates used to brace the cross members.

FAIRBANKS, MORSE & CO.
900 S. Wabash Ave., Chicago
32 branches at your service throughout the United States

Manufacturers of railway motor cars; hand cars; push cars; velocipedes; standpipes for water and oil; tank fixtures; stationary and marine oil engines; steam, power and centrifugal pumps; scales; motors and generators; complete coaling stations.



The complete power unit of the "Sheffield 44-B." This clutch positively cannot be burned out.

Unusually large crankshaft of the "Sheffield 44-B." The outer races have been moved aside to show the Timken bearings.

FAIRBANKS-MORSE
MOTOR CARS

Tells the Operating Advantages of these Modern Cranes

This 24-page booklet was prepared to give you detailed information on the operation of gasoline and Diesel locomotive cranes. It outlines the substantial savings made in labor required, in time and attendance, in the fuel used, and in maintenance. It also gives capacities of the various models, and indicates the sizes suitable for different classes of material handling.

These machines, pioneered by ORTON, are the result of years of experience in automotive application as well as crane manufacture, and each model represents a distinctive design, unified so that all of the numerous advantages of internal-combustion-engine operation are fully realized. Write for Bulletin 67.

In addition to a complete range of types and capacities, ORTON Cranes are made for many special-purpose applications.

ORTON Engineers are at your service to assist you in analyzing your material-handling requirements, in making plans and layouts, and in estimating the cost of the entire installation.

ORTON CRANE & SHOVEL CO.
608 S. Dearborn St., Chicago, Ill.
Representatives in Principal Cities
Special Railway Sales Representative: Thos. D. Crowley & Co., 8 S. Michigan Ave., Chicago

Three Major Problems of
Roadbed Construction are--

1-Drainage
2-Drainage
3-Drainage!

Experience has demonstrated that safety of roadbed and economy of maintenance are dependent on correct drainage.

In solving the practical problems of railway drainage GOHI Corrugated Culverts possess outstanding advantages. More than 20 years' service have established their remarkable durability. The reason is—*GOHI pure iron-copper alloy base metal.*

Easily handled, quickly installed at low cost. Because of great *flexible* strength, freezing water, settling fills, or heaving of earth due to frost action, cannot crack the culverts or cause sections to pull apart.

GOHI Culverts insure durability plus trouble-free, economical service. Write today for all the facts.

GOHI CULVERT MANUFACTURERS, Inc., Newport, Ky.

The Newport Culvert Co.
Newport, Ky.

The Pennsylvania Culvert Co.
Philadelphia, Pa.

Denver Steel & Iron Works Co.
Denver, Colo.

A. N. Eaton, Metal Products
Omaha, Nebr.

Feenaughty Machinery Co.
Portland, Oregon

Tennison Brothers
Texarkana, Ark.

Capital City Culvert Co.
Madison, Wis.

Central Culvert Co.
Ottumwa, Iowa

Roanoke Sales Corp.
Roanoke, Va.

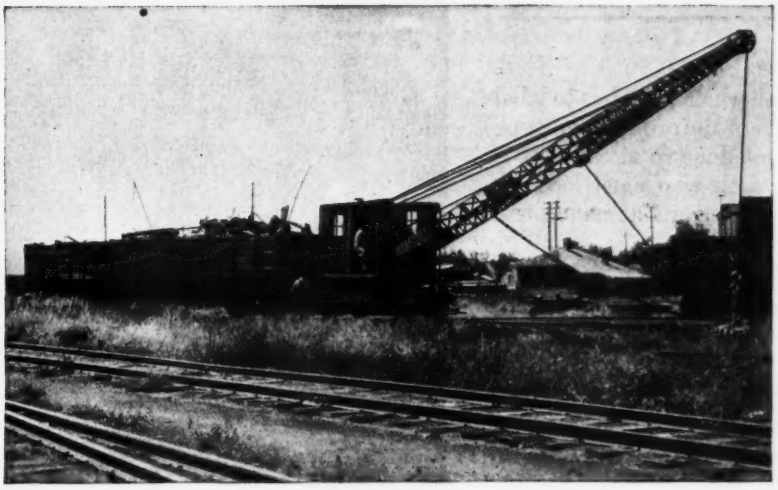
St. Paul Corrugating Co.
St. Paul, Minn.

Tennison Brothers
Oklahoma City, Okla.

(Meets copper-bearing pure iron requirements in all accepted specifications for corrugated metal culverts.)

GOHI
PRONOUNCED "GO-HIGH"
Corrugated
CULVERTS

AMERICAN EAGLE CRANE



There was about a carload of scrap scattered in the weeds along a side-track on the C. M. St. P. & P. at Aberdeen, S. D. It would have taken a gang of 5 to 7 men three days to pick it up and load it on a car. The "AMERICAN EAGLE" Crane switched out a gondola and with its 35-inch magnet swept the weeds where the scrap lay; in three hours loaded all the scrap in the area. ¶Strictly one-man operated, very compact. Can work on 12-foot center tracks without interfering with train traffic. High travel speed.

OUT OF THE EXPERIENCE OF 48 YEARS

Quality Engineering

AMERICAN

The Name to Remember

HOIST & DERRICK CO.

Saint Paul, Minnesota

ASSOCIATE COMPANY

DOMINION HOIST & SHOVEL CO., Ltd.,

MONTREAL, CANADA

AWAY *with* OLD PAINTING STANDARDS!

DU PONT DULUX gives greater protection, longer life and better appearance to metal surface

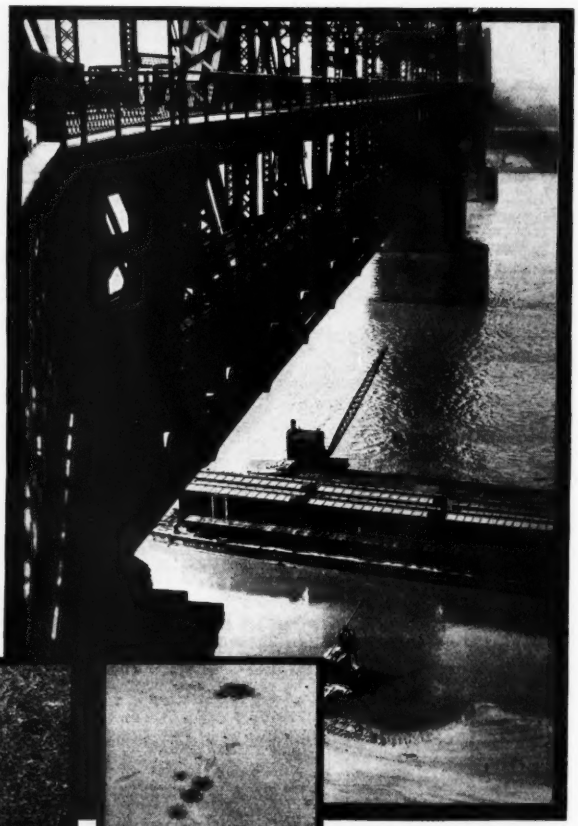
THIS is a story of a finish which promises to label metal protective paints of the ordinary oil type old-fashioned—if it has not done so already. It is more than a hint to the man who must look for more effective ways of cutting maintenance and upkeep costs.

Here are the reasons. During three years of field testing du Pont Dulux has shown 50 to 100% greater durability than high-grade metal protective oil paints. This means greater protection and life for all types of equipment. It has proved its ability to retain its original gloss and color 50 to 100% longer than do ordinary paints.

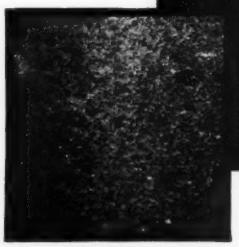
When other finishes have failed, Dulux still gives thorough protection to the metal surface and still keeps its good appearance. Simply because chalking of the film starts at a later date than in ordinary finishes and is much slower. There is no checking, cracking and peeling as with ordinary finishes.

A Dulux finish dries faster than other finishes for metal. Its film is unusually hard and glass-like and, hence, is more resistant to scratching. It is more impervious to moisture, corrosive gases, oils and salt air than the finest exterior finishes. Can you think of more ideal finish for railroad structures and equipment? Dulux offers greater protection, longer life and better appearance. It reduces the number of painting operations. It cuts maintenance costs. It is made to order for railroad use.

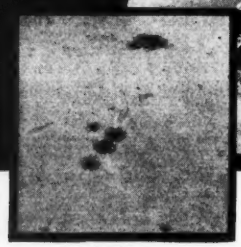
Isn't Dulux worth further investigation? We have only touched on the high spots here. Let us give you a complete picture of this second revolutionary du Pont development in finishes in the last ten years. For complete information, write E. I. du Pont de Nemours & Co., Inc., Dept. S 3, 1616 Walnut Street, Philadelphia, Pa.; 2100 Elston Avenue, Chicago; 351 California Street, San Francisco.



It is on jobs like the bridge above that Dulux saves so much money on maintenance.

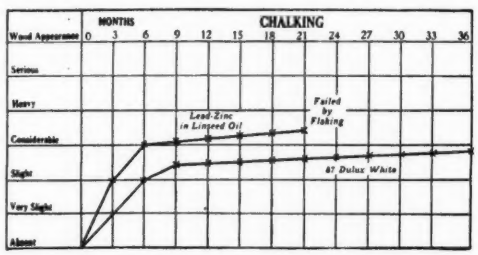


Best Metal Protective Paint, 7 months' exposure



Dulux 19 months' exposure

Dulux shows 175% greater durability in this test.



This graph shows difference in chalking between Dulux white, and lead and zinc in linseed oil. Note much slower chalking for Dulux. It means greater durability.

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ELECTRIC TIE TAMPING

Tamper for use in rock ballast

economically meets any tamping condition

Regardless of the type of ballast, the Jackson Electric Tie Tamping Equipment will master the job in an economical manner.

Tamper for use in gravel ballast

Electric current is supplied by the Jackson Portable Power Units, built in sizes to operate 2-tool, 4-tool and 8-tool outfits. They readily accommodate any size of gang from the small section to the large extra ballast gangs.

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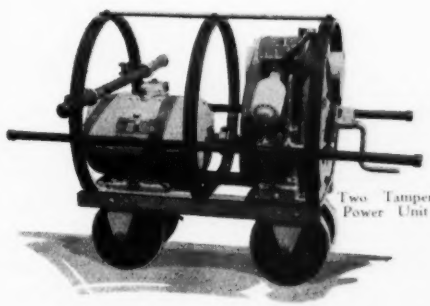
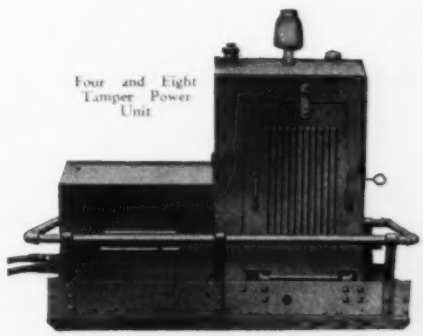


Two Tamper Power Unit



Four and Eight Tamper Power Unit

ELECTRIC TAMPER & EQUIPMENT CO.

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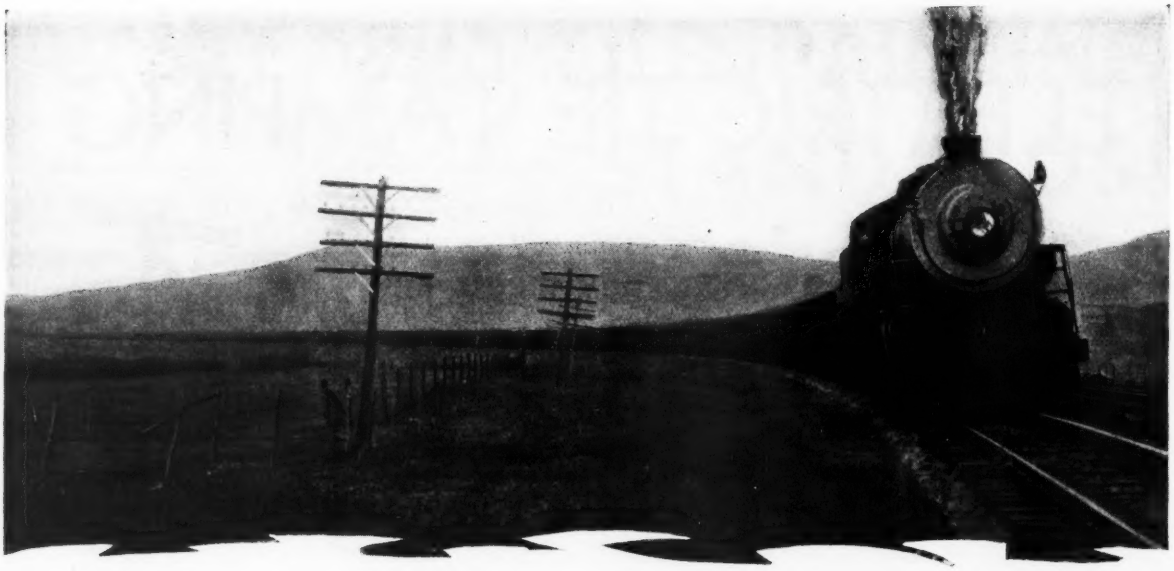

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SAVES RAILS and SWITCH POINTS

THE waste of expensive steel on curves, yard leads and switches arising from the incessant, grinding action of unlubricated flanges, is a condition that can be eliminated—at once—by the use of Mexican Graphite Curve Grease.

Here is one way to effect big economies without the necessity for heavy initial investments. The total cost of applying Mexican Graphite Curve Grease is slight—practically negligible—when compared with the saving it effects in track steel, switch points and maintenance expenditures.

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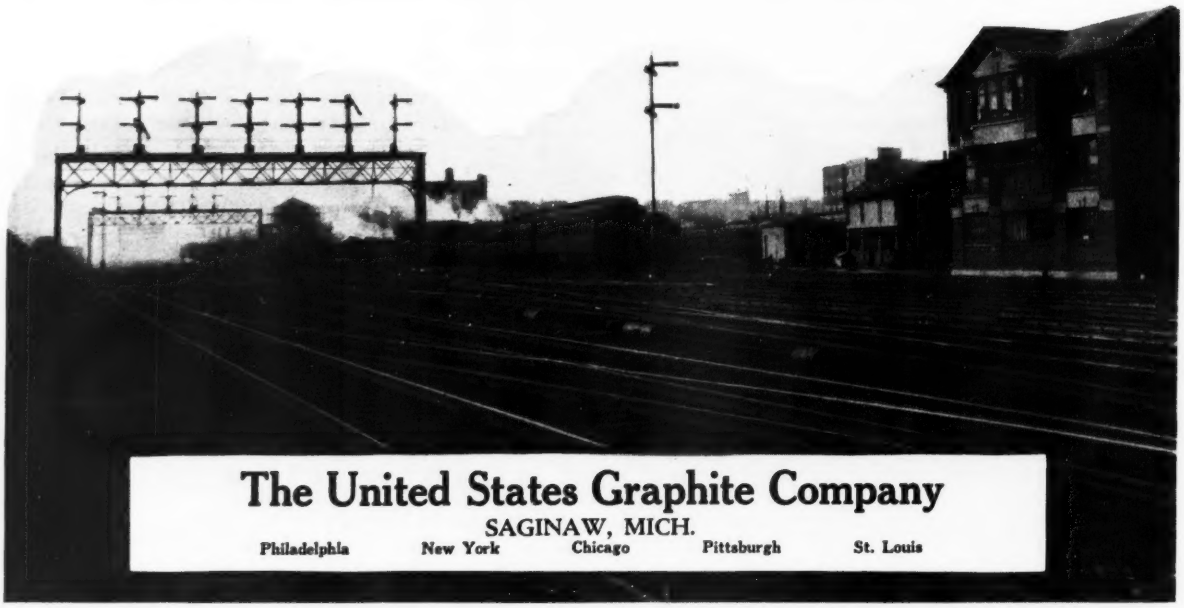
The graphite it contains is powdered to an extreme fineness and under the rubbing action of wheel flanges these fine particles become embedded in the steel—that's why a thoroughly lubricated surface is provided long after the grease itself has finally disappeared.

Rain, sleet and snow will not affect the efficiency of Mexican Graphite Grease. Why not give it a trial?



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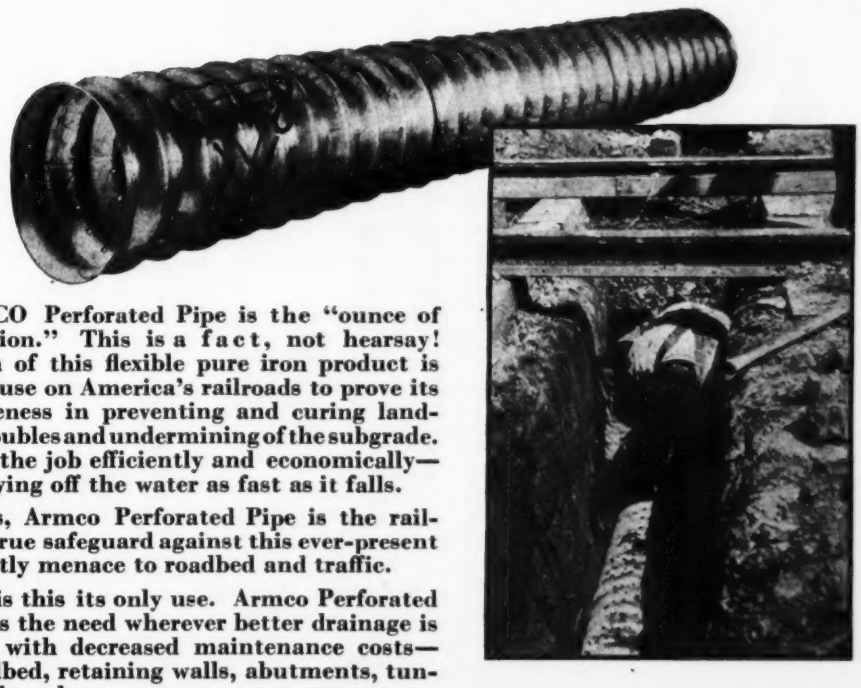
Philadelphia New York Chicago Pittsburgh St. Louis

THE OUNCE OF PREVENTION

ARMCO *Perforated* PIPE

THAT PREVENTS A POUND OF LANDSLIDE TROUBLE



ARMCO Perforated Pipe is the "ounce of prevention." This is a fact, not hearsay! Enough of this flexible pure iron product is now in use on America's railroads to prove its effectiveness in preventing and curing landslide troubles and undermining of the subgrade. It does the job efficiently and economically—by carrying off the water as fast as it falls.

Thus, Armco Perforated Pipe is the railroad's true safeguard against this ever-present and costly menace to roadbed and traffic.

Nor is this its only use. Armco Perforated Pipe fills the need wherever better drainage is desired with decreased maintenance costs—for roadbed, retaining walls, abutments, tunnels and yards.

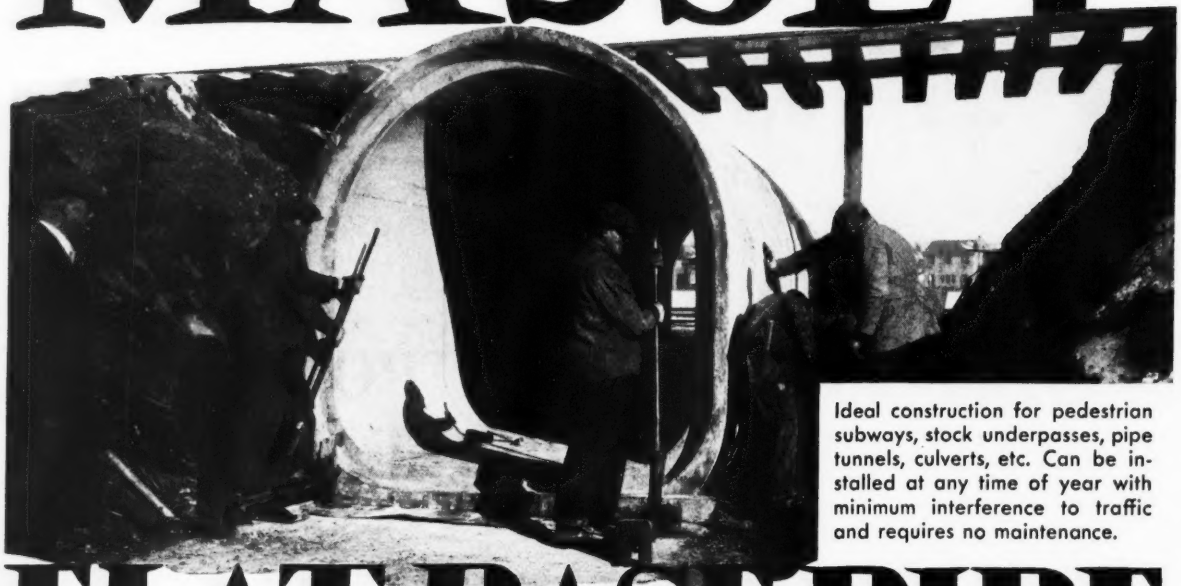
Armco Perforated Pipe and Armco Culverts are made from *Armco* Ingot Iron, the Nature-tested product with an unequalled record of 25 years continuous service under the railroads and highways of America. More than 75,000,000 feet in use today testify to the durability of these pure iron products

Factual data on Armco Perforated Pipe in use in landslide areas and under other conditions, will be sent on request.

Armco culverts and drains are manufactured from the ARMCO Ingot Iron of The American Mill Company and always bears its brand.

ARMCO CULVERT MANUFACTURERS ASSOCIATION
Middletown, Ohio

MASSEY



Ideal construction for pedestrian subways, stock underpasses, pipe tunnels, culverts, etc. Can be installed at any time of year with minimum interference to traffic and requires no maintenance.

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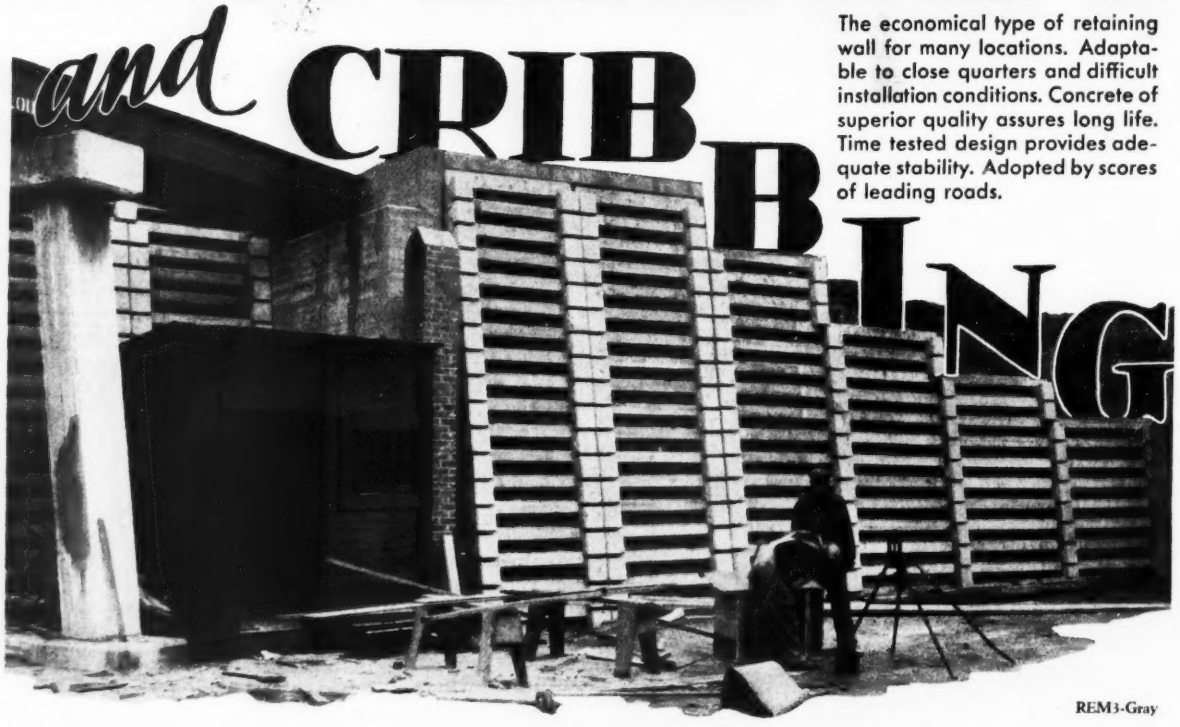

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TIE TAMPERS

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Only One Moving Part

How the Tamper Operates:

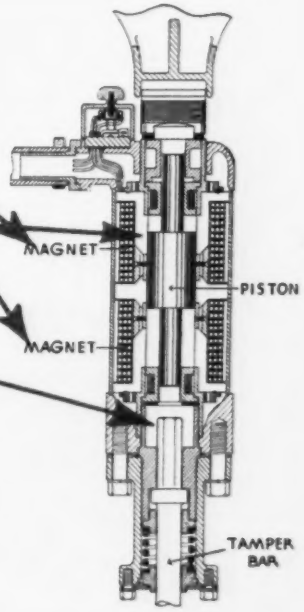
TWO MAGNETS

Reciprocate the

PISTON

That strikes a fast, hard percussion blow on the shank of the

TAMPER BAR



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The frog is carefully inspected for hidden cracks and defects.
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Welding with MORRISON METAL and peening is begun, layer upon layer.
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Work is done in track under traffic. No suspension of traffic is necessary.
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This service, already used on over 200 crossings by 18 of America's greatest railroads, is now available to you at a small fraction of the cos of new crossings. Write today for more detailed information.

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No. 27 of a series

Railway
Engineering and Maintenance
SIMMONS-BOARDMAN PUBLISHING COMPANY

105 WEST ADAMS ST.
CHICAGO, ILL.

Subject: Don't Be a Bass

February 26, 1931

Dear Reader:

A friend sent me a story a few days ago about a a naturalist who divided an aquarium into two sections by means of a clear glass partition. In one section he put a lusty bass and in the other a number of minnows. The bass struck every time a minnow approached the glass partition. After three days of fruitless lunging, which netted him only bruises, he ceased his efforts and subsisted on the food that was dropped in. Then the naturalist removed the glass partition. The minnows swam all around the bass, but he did not strike at a single one. He had been thoroughly sold on the idea that business was bad.

It occurs to me that this story is not without its application to present conditions in the railway and railway supply industries. I fear that too many of us are like the bass in that we are inclined to give up when we get a few punches on the nose. Yet no one ever made a success in that way.

The country is not "going to the dogs". Neither is an industry that is so essential to our modern life as the railways. So long as they operate, men will have work and supply companies markets. But the largest returns will go, especially in times like these to the one who fights hardest—and keeps on fighting.

Yours truly,

Elmer T. Howson

ETH*JC

Editor.

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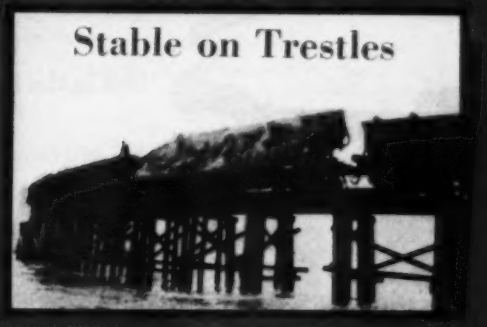

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Magor Car Corporation

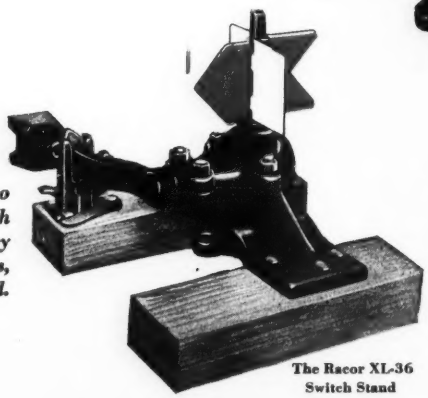
50 Church St. **New York**

IT'S SO SIMPLE

This is the handle and shaft of the Racor XL-36 Switch Stand . . .

The lower bearing of the shaft is inserted in a **roller. Fastened to the shaft by a cotter pin, the roller slides into** **the slot of the spindle. These members, of extra large wearing surfaces, are the only working parts and, set in the** **base, make** **this very simple yet highly efficient mechanism. The extreme simplicity of it is evidenced in the picture. Adding the cover** **completes the stand.**

LOST motion and trouble from wear so prevalent in ordinary low, rigid switch stands are eliminated. Designed for heavy service in yards and on main lines, where rigid switch stands are preferred.



The Racor XL-36 Switch Stand

THESE stands are gearless and parallel throw. They have stood the test of time and use . . . Write for free booklet postpaid. It tells of the use and installation of the Racor XL-36 Switch Stand.

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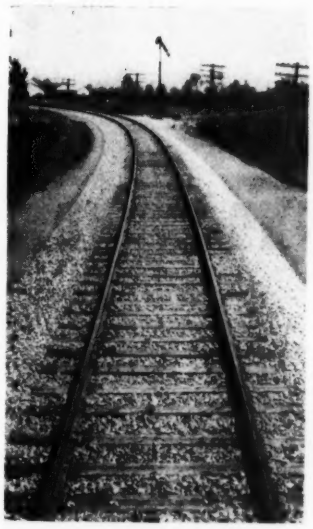

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Railway Engineering and Maintenance

NAME REGISTERED U. S. PATENT OFFICE

MARCH, 1931

Editorials - - - - - - - - - - - - 233
Fight for your jobs—New devices—Improvements—The N. R. A. A.

The Biggest Problem of Today - - - - - - - - - 236
F. W. Hillman, W. H. Kirkbride, A. A. Miller, A. N. Reece and R. E. Woodruff present their views on current questions in the use of equipment

The Value of Equipment Lies In Use - - - - - - - - 240
New York Central obtains maximum return from appliances by imposing responsibility for output and upkeep on the divisions and subdivisions

Care and Repair of Equipment - - - - - - - - - 244
Pennsylvania maintains organization for the upkeep of its appliances that provides centralized direction of field and shop supervision

Painting the Quebec Bridge - - - - - - - - - - 250
A single coat on this great structure requires 7,500 gal. of paint and three years' work with a crew of 40 men using spray equipment

Manufacturers Make Progress - - - - - - - - - 255
Supply Companies continue efforts to improve equipment designed to take the drudgery out of maintenance work

Proving Their Worth - - - - - - - - - - 257
Service data on the actual performance of various appliances designed to effect economies in maintenance work

New and Improved Devices - - - - - - - - - 260
Descriptions of recently introduced appliances or of new models of equipment already in use on the railways.

Railway Appliances Exhibit - - - - - - - - - 271
Display of maintenance devices at the Coliseum will be of great interest during "Engineering Week" in Chicago

What's the Answer? - - - - - - - - - - - 273

News of the Month - - - - - - - - - - - 281

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with the force of a 100 pound sledge when—

the 3-in-1 switch stand is used

IT'S a fact . . . the Racor 3-in-1 Switch Stand eliminates that terrific pounding which wears and breaks stands, points and wheels by the thousands every year. This elimination of pounding is accomplished by combining in a single unit an automatic double coil spring returning points after trailing train has passed, an oil buffer preventing return of points between successive pairs of wheels, and a rigid throw always ready for hand operation.

It provides a continuous right of way in both directions. A rigidly connected target always shows the exact position of the switch points. With the 3-in-1 there is no necessity to stop trains to operate the switch or the expense of control from a distant tower.

This switch stand is saving thousands of dollars at every location it is used . . . Write today for complete printed information about the 3-in-1.

The automatic double-coil spring returning points after trailing train has passed.

The adjustable oil buffer preventing return between successive pairs of wheels.

* * *

The rigid-throw always ready for hand operation. Parts simple and readily accessible for oiling and inspection.

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Railway Engineering and Maintenance

FIGHT FOR YOUR JOBS

Employees Must Protect Their Interests

IN A statement to its employees, the management of the Nashville, Chattanooga & St. Louis railway directs attention to the fact that "five years ago this road had 9,684 employees; now it has 6,807. Five years ago it operated 76 passenger trains daily; now 32. It once hauled 4,500,000 revenue passengers a year; now less than one-third of that number. The movement of package freight by railroad is but half what it was five years ago, the number of agency stations has decreased from 239 to 151; more than 40 miles of track have been torn up and abandoned; applications are pending for authority to abandon 11 miles more; and every possible economy is being practiced to save other portions of the line."

J. T. Gillick, operating vice-president of the Chicago, Milwaukee, St. Paul & Pacific railway has addressed the employees of that road in a similar vein, calling attention to the decrease of more than $27,000,000 in the gross earnings of that carrier in 1930, as compared with the preceding year and to the further striking fact that the gross earnings were $2,400,000 less than in 1920. Mr. Gillick points out that until the causes that are contributing to this condition are corrected, the railways have no alternative other than to continue to curtail their maintenance and other expenses and to reduce the number of employees and the amount of materials purchased.

The Cause

The present railway situation—for the Nashville, Chattanooga & St. Louis and the Chicago, Milwaukee, St. Paul & Pacific are no worse off than the average railway in this respect—is, as outlined in the February issue, largely the result of new and intensified competition from other transportation agencies, outstanding among which are the motor coach and the motor truck. These agencies are using the highways as a "place of business" without paying adequate compensation therefor, are not taxed on a basis comparable with the railways and are not required to maintain standards of service equal to those of the railways.

Despite the efforts that are being made in certain quarters to convey impressions to the contrary, the railways have no quarrel with the private automobile owner. They do not ignore the fact that the automobile has introduced a new era in our transportation development. Neither do they deny that the public has a right to select the form of transportation which it prefers. The highways are built and maintained by the tax-paying public and the railways recognize that, for all practical purposes, the 24,000,000 owners of private automobiles constitute the tax-paying public.

Their contention is directed against the motor coach and the motor truck which use the highways, built and maintained at public expense, for the conduct of business for private gain without paying proper rental therefor. They claim the right to demand that they receive fair and equal treatment at the hands of the public with those with whom they are forced to compete in the transportation for pay of persons and property on the highways.

Where Is Competition Unfair?

Wherein is the present competition unfair? It is unfair in a number of respects. In the first place, the buses and trucks are not paying their fair charges for the use of the highways. "Bus Facts", an official publication of the National Automobile Chamber of Commerce, is authority for the statement that the bus lines paid 7.23 per cent of their gross revenues for taxes in 1928. In the same year the railways paid 6.37 per cent of their gross revenues for taxes. If we assume that the latter figure is a fair tax to be levied by the government upon the property of operators of motor buses and railways, it leaves only 0.86 per cent of the gross revenues of the bus lines for rental of the highways. The utter inadequacy of this figure is shown by the fact that the railways spend about 14 per cent of their gross income for the maintenance of the "highways" used in the conduct of their business.

Considered from another angle, buses and trucks are now taxed in two ways—through license fees and a tax on the gasoline which they consume. Statistics issued by the National Automobile Chamber of Commerce give the average license fee for a three-ton truck as $298.22. These statistics also show that there are 29 states in which the license fees are less than this figure, and that in these states the fees average only $118.26. In the remaining 19 states, on the other hand, the average fee is $537.07, while the maximum is $937.50 in Iowa. If the fee charged in the latter state, or even the average fee for the 19 highest states, is not excessive, and the motor transportation interests have not shown that it is, it is self-evident that motor coaches and trucks are being subsidized heavily in the other 29 states, where the fees run down to as low as $18 in Missouri. Obviously, this subsidy comes from the public which is providing and maintaining the highways that are used by these motor vehicles.

The results are equally discriminatory against the pub-

lic with reference to gasoline taxes. On the basis of the gasoline consumption per ton mile (a unit that recognizes both weight of machine and distance traveled), it can be shown that the tax paid by a heavy motor coach or truck is only one-third of that paid by a Ford passenger car, in spite of the fact that the heavy vehicle is admittedly far more destructive to highways than the lighter car.

Duplication of Service

From still another angle the present motor transportation competition is unfair. In the Transportation Act of 1920, provision was inserted prohibiting a railway from constructing a new line without permission from the Interstate Commerce Commission. Under this provision the commission has consistently refused to permit one road to build a line parallel to another on the ground that such action would constitute an economic waste. In effect, the inauguration of motor coach or motor truck service on a parallel highway is the same as if another railway had been built. If the one is economically unsound, then the other is equally so.

In still other respects the railways face unfair competition from buses and trucks. They cannot choose whom they will serve or the classes of freight they will handle; they must haul for all alike, at rates fixed by public authorities and published and known to all; they are subject to strict regulation as to details of their service, safety appliances, working conditions of employees, etc. No comparable requirements are enforced on motor coaches and trucks, but on the contrary they are free to select that traffic which they may endeavor to handle; to alter or suspend schedules at will, to hire whom they wish, and pay what wages they desire. In short they are free to operate as they see fit in competition with the railways, whose operations are controlled in minute detail by representatives of the public.

Built From Public Funds

In brief, the highways are built from public funds for the use of all persons in the conduct of their own business. The motor carrier for hire, however, uses the highway not as an incident in the ordinary pursuit of business or pleasure, but as in itself a "place of business" for a profit-making venture in public transportation. As such, it should be required to pay not only the usual taxes which are paid by all operators of motor cars, but in addition a reasonable compensation for such use of the highways as a place for doing business. It should also be brought under the same regulation as a common carrier as the railways with which it has set out to compete, in regard to character and regularity of service, stability of rates, responsibility for claims, conditions of employment, etc., that has been declared to be in the interest of the public with regard to the railways. Only when such provisions have been enacted will competition be fair.

What Can Employees Do?

What can railway employees, and particularly those of the maintenance of way department, do to remove the inequality to which the railways are subjected? They can do many things.

In the first place, they are a very measurable force in influencing public opinion. This is especially true of maintenance of way employees, for they are to be found in every city, village, and hamlet. Furthermore, many of them are leaders in their communities, and their influence is correspondingly great. Recognizing this fact, the Brotherhood of Maintenance of Way Employees, at its last annual convention, adopted a resolution pointing out the unfairness of the competition to which the railways are subjected, and "pledged itself to join with other legitimate organizations and railway managements and to use its influence to bring about a strict public control of the operation of these competitive carriers * * * and that we use all means of informing other merchants and shippers of freight in communities in which they live of the result of a possible further decrease in railway labor due to the divergence of traffic from the railroad to these other agencies." The organization voted also to conduct an educational campaign to encourage merchants to patronize the railroads.

With their jobs at stake, maintenance of way employees, in common with those in other branches of railway service, owe it to themselves and their families to acquaint themselves fully with the unfair competition which jeopardizes their own employment. With these facts in mind they can do much to inform those with whom they come in contact regarding the situation and to encourage those who are in a position to direct the routing of freight or of passengers to send it over the railways. As citizens they also have the right of the ballot to select as their representatives in local, state and national law-making bodies those men who will most properly represent them and their interests.

Employees Must Fight

The problems confronting the railways today are no longer solely those of the management. They are just as much the problem of each individual employee. To the extent to which other and newer agencies of transportation can serve the public better or more economically, public interest will be promoted by using those agencies and no railway or railway employee can long take issue therewith. To the extent, however, that traffic is being diverted to these agencies on bases other than those of equality of opportunity and regulation, the railways and their employees have just cause for complaint. They owe it to themselves to insist that the past inequalities be eliminated. It is time to fight.

The N. R. A. A.

Have You Planned to Visit the Exhibit?

TWENTY-TWO years ago an organization known as the Road and Track Supply Association, which had previously held small exhibits in the hotel where the convention of the American Railway Engineering and Maintenance of Way Association (now the A. R. E. A.) was in session, set out on a new venture. It leased the Coliseum in Chicago for an exhibit of far greater scope than any it had previously undertaken.

Since that date, this supply show, which later became

known as the Annual Exhibit of the National Railway Appliances Association, has been held every year at the same place. Furthermore, it has far outreached its original import, for it attracts hundreds of visitors who have no affiliation with the A. R. E. A., but who are, nevertheless, as much interested in the materials on display as any who participate in the convention.

Why is this exhibit visited year in and year out by so many maintenance officers? One reason lies in the fact that the railway supply industry concerned in the manufacture and sale of products used in the construction and maintenance of tracks and other fixed structures has had an unprecedented growth during the life of the N. R. A. A. Those 22 years are contemporaneous with the real development of power tools and equipment in this field. In 1909, a few gasoline pumping engines, some primitive motor cars and a concrete mixer or two comprised almost the entire line of power machinery on display. What the progress has been since that time every practical maintenance officer knows.

Another reason lies in the business-like manner in which the exhibits have been conducted. The participating companies have worked together for one common purpose—to present a display of definite educational value. Thus railway men have learned that these annual displays afford an opportunity to keep abreast with current developments that can be had in no other way. There they can compare one device with another, and, incidentally, learn much from officers on other roads concerning the service rendered by the equipment that is being exhibited. The educational opportunities afforded by the exhibit to be held this year are greater than usual because, as outlined on other pages of this issue, progress in the development of new devices during the past year has been of an outstanding character. No maintenance officer can afford to miss it.

NEW DEVICES

No Halt in Development of Improvements

THE year 1930 was an active one in the development of appliances for use in the maintenance of railway tracks and other structures. Ample evidence of this is afforded in the 11 pages of this issue devoted to descriptions of new appliances or of redesigned or improved devices. Yet these pages are concerned only with developments that were announced by the manufacturers within the last month or two, and do not in any way duplicate material presented in the department of New and Improved Devices in previous issues. A more comprehensive idea of the accomplishments of the past 12 months is to be found on page 255 of this issue, where an effort has been made to review current trends in the design of various appliances.

Obviously these trends, as manifested in any one year, do not necessarily presage the nature of the development that is to follow in succeeding years. Neither does it follow that all devices brought forth will prove eminently successful. However, one thing is certain—there are fewer false moves in this day of the manufacturer of mechanical appliances for use in roadway and structure work than there were in the years when the use of power-tools in this field was almost entirely experimental. In this connection, it is significant to observe that nearly all of the equipment described is the product of well-known companies. But what is of still greater importance is the fact that so much new equipment was brought forth in a period of curtailed business, an unmistakable evidence of faith in the stability of the railways and in their determination to foster further progress in the mechanization of maintenance of way work.

IMPROVEMENTS

Save Money By Starting Construction Now

PRESENT conditions in the construction field afford an exceptional opportunity for those railways that are contemplating improvements to or expansion of their facilities to effect savings in construction costs. Commodity prices are at such a level and the efficiency of labor is so greatly increased, as contrasted with even a few months ago, that materials can now be purchased and contracts can be let on unusually favorable bases. Furthermore, construction materials can be obtained promptly, thus eliminating that class of delays which so frequently disrupt construction programs. Again, reduced traffic makes it possible to do many classes of work with less interference from trains, which, in itself, often represents a definite economy.

That this condition is appreciated in some quarters is indicated by a statement issued four days ago by President Atterbury of the Pennsylvania. According to an official announcement, that road, having canvassed the present situation, has concluded that "now is the time to go forward with redoubled energy" with the extensive program of improvements upon which it embarked a little more than a year ago. This program contemplated an expenditure of $90,000,000 during 1930, although actually $106,000,000 of construction work was done during the year. The remainder of the work, estimated to cost $175,000,000, was scheduled over a period of four years.

In order to take advantage of the present conditions, General Atterbury announces the decision of the management to complete this program in 2½ years. To do this will involve new financing, "but the Pennsylvania, in view of the present low interest rates and the plethora of savings in the country that are available for investment as soon as confidence is restored, regards the present and near future as a most favorable occasion for the necessary financing."

It is almost axiomatic that the present low volume of business can be only temporary. It follows that the present favorable construction conditions will not last long, and, in view of the inevitable demand for service which will be made of the railways with the return of business activity, it would seem that the managements of other roads can well consider the economy in construction costs which the present situation offers, and plan their improvement programs accordingly.

The Biggest Problem Today

in the Use of Work Equipment

What must be done to insure the maximum economy in the employment of labor-saving devices

LABOR-SAVING equipment has been in general use in railway maintenance for too short a time to permit the complete solution of any of the major problems connected with its employment. There are also numerous problems of a secondary nature, which, in themselves, are of considerable but varying importance, which must be taken into account if the full measure of economy is to be obtained from the use of the machines. Those roads that have made the greatest advances in the use of such equipment find almost daily that some new problem or a new phase of some older problem rises to perplex them. They also find that both the major and secondary questions are so interwoven that it is often impracticable to segregate them or study them individually without bringing in one or more of the interdependent features of the problem they have under consideration.

No two officers are in complete agreement as to what constitutes the most important problem in the use of labor-saving equipment, since their views are influenced by their own experiences and the conditions under which they have employed it. They are aware of the interdependence of the various phases of the general problem, however, and of the fact that none of them can be ignored, if the fullest economy is to be obtained from the use of labor-saving devices.

In order to develop the relative importance of these problems and the methods that are being used to solve them, several prominent maintenance and operating officers have been asked to give their views on these subjects. Their views follow.

Best Solution Is Study and Planning

By R. E. WOODRUFF
Vice-president Operation, Erie, New York

BASICALLY, the problem is to get the greatest efficiency out of available equipment. The solution to the problem is proper study and planning on the part of those who handle the equipment. This study and planning is of several different kinds, but has for its purpose:

1. To determine what a machine can do more efficiently than other machines or hand-work.

To be able to use a machine efficiently there must be sufficient work. A small job can be done better by hand. As an example, a contractor had an $800 job, and because he had a stiff-leg derrick, he shipped it to the work and used it. This cost him $350, and he lost money on the job, whereas, if he had used ordinary labor he would have made money. Some of our men are afflicted with "machinitis," and they fail to do little jobs by hand which really could be done cheaper in this manner than with a machine. There are still some places where, because of traffic or other conditions, an old-fashioned wheelbarrow is still a useful and efficient tool.

2. To learn how the work of the machine can be improved.

To some extent this is the problem of the manufacturer, yet those who use the machines are also interested. With the first moles (ballast-cleaning machines), the refuse was carried away in baskets. Later a conveyor was built to distribute the refuse beyond the ballast line, eliminating the hand-work. Later still a device was placed on the same machine to trim up the stone behind it, thereby saving considerable manual labor. The first mowing machines were more efficient than hand-work, but they did not cover all the territory they should have reached. A careful study, combined with tests of speed, position of cutting bars and position of machine relative to the track, brought greater efficiency, reducing hand-work to a minimum.

3. To find under what conditions more work can be done per day.

With some machines the chief requirement is proper maintenance, and the machine will do good work continuously if kept in repair. In other machines, the question is that of having a skilled operator, which means proper training by the supervisor. Some machines involve the use of the main tracks, and work trains. To get the most out of a work train requires a study of traffic conditions. There are certain hours each day on many railroads when work trains do not have much chance on some one of the tracks, and there are times when work can well be shifted from one track to another to take advantage of traffic conditions. There are some days in the week when traffic is light and the main track can well be utilized for a large job. There are also times when it is advisable to divert all the traffic from a track to enable the maintenance of way men to have uninterrupted use of it for a number of hours continuously.

4. To devise means whereby the machine can be used more months in the year.

The tendency now is toward service machines. Locomotive cranes, for example, can do a variety of work, such as grading, distributing and laying rail,

picking up old rail, handling ballast, erecting bridges, etc. Most pile drivers now can be used as locomotive cranes when they are not employed as pile drivers. Spreader and shaper cars are used in construction and maintenance during the working season, and of late for handling snow during the winter months. Tie tamper machines are used for lagging when the tie tamping season is over, and can also be used for bridge erecting work in the winter.

Should Be Kept in Use

Machines should never be idle unless this is unavoidable. It is unnecessary for each division of a railroad to have a full outfit of machines. The essential thing is to make a program showing the sequence of use for each machine, based on requirements of the service. Intelligent consideration is necessary to determine what the machine can do and then prepare a definite program for its use. During the working season, certain reports are necessary showing what progress is being made, so that, if the program is not being adhered to, the cause can be ascertained and the proper remedy applied.

In the use of work equipment, as in many other maintenance matters, there is a tendency to turn out volume rather than a proper quality of work. Accordingly, it is necessary that the quality of work be checked periodically, as there is nothing to be gained by doing a large amount of poor work.

The essence of the problem, then, is to take men who have been brought up to do work by hand and educate them to become "machine-minded." This involves constant study of machines, of methods and of programs on the part of the supervising officers who, in turn, must train the foremen who are to be in direct charge of the operations in which the machines are employed.

Constant Use Is Needed for Greatest Economy

By W. H. KIRKBRIDE

Engineer of Maintenance of Way and Structures, Southern Pacific, San Francisco, Cal.

RAILWAY maintenance engineers are depending more and more on labor saving tools in connection with the construction and maintenance of tracks and appurtenant structures. The need for such equipment and the obvious economies resulting from its use have been so apparent that railroad managements have displayed an active interest in the purchase of such tools.

The result is that the roadway-machine and tool-investment accounts of all the railways have been increased by millions of dollars during the past few years. The value of this investment, involving many different types as well as a large number of these tools, has placed an added responsibility upon the maintenance engineer. This has been met partially by the creation of positions which are usually designated as supervisor of work equipment.

Maintenance departments are becoming diligent in the prosecution of their work with these new tools, and point with pride to the economy and dispatch with which it is being done. Frequently, the desire is expressed to have more tools of the same variety so that each division of the railroad may complete its work independently and move quickly, and handle emergencies without the delay which results from transferring equipment from one division to another.

Great stress is being laid upon the supposed savings, as reflected by reduced unit costs, based only on labor and material factors. I wonder how often consideration is given to the carrying charges of road tools. Do the unit-cost prices ever include interest and amortization? Such charges are accruing daily, even though this may be unknown to the man on the job. Herein lies the danger of stocking up with too much special machinery. In my opinion the answer to the inquiry, "What is the biggest problem today in the utilization of work equipment?", is contained in the answer, "To keep the work equipment working."

What does it profit a railroad, so far as net dollars in the treasury are concerned, to provide a special tool costing thousands of dollars that, after being used on one or two special jobs, lies idle for the greater part of the year? It is axiomatic in the transportation department that cars must be kept moving.

I believe that it is the duty of the maintenance officer to apply the same principle to his own affairs. Before purchasing special equipment, the need for it should be analyzed carefully and the question answered honestly as to whether there is sufficient work to keep the machine busy a sufficient time during the year, and every year during its probable life, to justify its purchase. Attention should be given to the possibility of obsolescence, due to the development of new and improved designs. Likewise, his inventory stocks, including tools, section motor cars, outfit cars, etc., should be kept down to a figure which will enable the property to be maintained economically, while at the same time meeting the usual emergencies with dispatch.

Construction Vs. Maintenance

On a large construction job it will be found possible to buy the most modern equipment and wear it out on the job. In other words, it pays for itself and can then be disposed of. In maintenance work, the problem is somewhat different, in that the special equipment will be used on work that is practically continuous, with a constantly recurring series of jobs represented by betterments and additions. If the work is not so programmed as to keep this special equipment continuously at work and it is allowed to lie idle for many months at a time, the machine, in the final analysis, judged by net dollars placed in the treasury of the railroad company, will prove to be uneconomical.

Lost time may be accounted for in three general ways: (a) Machines unassigned; (b) machines in the shop undergoing repairs; and (c) delays on the job. Undoubtedly the greatest amount of lost time is the result of machines being unassigned. This factor can be reduced by watchfulness on the part of the maintenance officer and the supervisor of work equipment, and by the avoidance of a surplus of such equipment. It would probably be better to have fewer such tools and depend on transferring them from one division to another as needed. Certain jobs might be delayed temporarily; an orderly program of work will avoid undue delays, however, and actually tend to smooth out the inequalities of the labor curve, resulting in a more balanced force throughout the year.

Delays from being in the shop may result in labor losses. Delays in shops are relatively minor in extent, but may result in greatly increasing the cost of a particular job. They are often caused by the fact that the supervisor of equipment does not anticipate his repairs so that store and shop departments may have the opportunity to order special parts before machines are actually put in the shop. A constant follow-up policy will result in reducing such delays.

Time lost on the job is a matter of local supervision, and the officer in charge can display his initiative in reducing delays due to density of traffic, in securing co-operation of other departments and train and enginemen, programming the work, anticipating breakdowns, and by the use of diplomacy. Work trains are expensive and it will frequently be found more economical to perform small jobs by hand labor and with small tools, or by means of equipment that can be worked independently of the track. A study of the value of lost time of work equipment, including the interest and amortization charges of the investment, will be worth while to any organization in which such equipment is in constant use.

Efficient Planning and Supervision

By A. N. REECE
Chief Engineer, Kansas City Southern, Kansas City, Mo.

THE biggest problem at present in the utilization of work equipment is that of operating it to the best advantage under the appropriations available. Assuming that the chief maintenance officer has clearly outlined the current requirements, and that the appropriation for maintenance of way is as large as can be justified, it remains for him to analyze the work to be done, the work equipment and force available, and then to determine where and to what extent the use of the equipment will prove most economical.

The first step should be to secure from division maintenance officers complete lists of work equipment available, its location, physical condition and the repairs needed, if any. Along with this, the division officers should furnish statements showing the character, location and extent of the work to be done on their respective divisions in which work equipment may be utilized, as well as the time at which they will need the various items of equipment and the season which is best suited to their individual requirements.

Where To Use It

Having this information, the chief maintenance officer is then able to compare the cost of using the work equipment with the savings to be made, and considering the necessity for the work recommended and funds available, to determine the use he is justified in making of the equipment and to lay out a program of work to be done, together with a dispatching schedule for the equipment involved for several months in advance.

Many things must be considered in the preparation of such a schedule. Of first importance are the funds and labor available; the necessity for the work and the savings to be effected in labor and money; and the suitability of the various items of equipment for the work in hand. It is probable that the division forces will have outlined more work than the time and money available will permit being carried out. After having determined how much of the work is to be done, it remains to be decided whether it shall be handled by work equipment or otherwise.

If the appropriation permits only a minimum maintenance force, the use of work equipment must be confined to those jobs which will not necessitate the assignment of large forces to use it, so that it will be of the greatest value to the regular forces in their ordinary maintenance work. In connection with the latter, for instance, we found last year that by the use of a ballast dressing machine we could cover 30 miles or more of track per day in gravel ballast, doing the work in a manner that called for little finishing by hand, and at only a small fraction of the cost by hand labor. Obviously, the use of such equipment, and also of weed-burners or chemical weed-killers and power ditchers, will leave much more time available for the track forces to maintain track and do other urgent work.

Only practical and economical equipment should be used. The use of machines that are obsolete or in poor condition may result in false economy as a result of delays or of the amount of incidental labor required. If funds are available, it is usually economical to use sufficient force to operate work equipment to maximum capacity. However, with limited appropriations it may be found economical in certain classes of work to employ a smaller force and perhaps only a part of the equipment rather than to defer the work or do it by hand. Savings may often be made by the use of work equipment for jobs other than those for which it was specifically designed, such as the use of rail-laying cranes for handling material around yards or in certain classes of excavation.

Having determined the most suitable program for the work equipment under the existing conditions, adjusting it so far as possible to the seasonal weather to be expected, the division officers should be fully advised of that portion of the schedule affecting them in order that they may lay their plans in advance.

How to Use It

While the greatest problem at present in the utilization of work equipment, owing to the limited funds available with which to operate it, is to work out an appropriate schedule for its use, it is of scarcely less importance that its operation be followed up to insure that it is being handled efficiently. To accomplish this, the equipment must be repaired, if necessary, and put in good mechanical condition and thereafter operated only by competent men who will handle it carefully and give it systematic inspection, care and maintenance. Efficient operation calls for close supervision to minimize delays and maintain proper organization, and daily reports to keep the maintenance officer closely in touch with the work.

Delays due to equipment failures will be minimized by careful operation. Those due to traffic can be reduced by close co-operation with the transportation department to obtain reliable advance information as to arrival of trains, using field telephones if necessary, or by slightly changing the working hours to avoid interference with scheduled trains. Delays due to lack of material, improper planning or co-operation between gangs are entirely preventable and may be minimized by competent supervision.

Detailed time-studies of each operation in connection with the use of work equipment will frequently make it possible to speed up the work materially, by a slight rearrangement of the organization without any additional force. In order that the maintenance officer may keep closely in touch with the results being obtained from work equipment and be in position to correct any deficiency immediately, it is necessary that he be furnished with daily reports from each unit, showing the work accomplished, the number of man-hours engaged, details of the delays encountered, and other information.

Analysis of the problem shows that work equipment can be utilized most economically when working to a definite schedule determined by the needs and requirements of the road as a whole, or of extended sections of the larger system. Such a program should not be left to districts or small divisions to work for themselves;

furthermore, after a program is determined upon, it is essential that the operation of such equipment be given close supervision and kept on schedule and kept constantly and efficiently at work during the time allotted.

High Factor of Use Is Important

By F. W. HILLMAN
Assistant Engineer Maintenance, Chicago & North Western, Chicago

THE economic utilization of work equipment presents numerous problems, but because of the comparatively short time that such machines have been used widely in railway maintenance and also because of the rapid developments in design and utilization that are being made currently, it is difficult to say which of these problems is most important.

In considering the purchase of a labor saving device, the first thing to do is to determine whether its use is justified. This requires a careful study of the accomplishments and possibilities of the machine, as compared with manual operation. Care must be taken to see that enthusiasm based on a particular performance does not result in the purchase of too many units without the consideration of the amount of work on which the tool can be used. Savings resulting from the use of some tools is small, so that a large volume of work is necessary to justify their purchase. On the other hand, the savings may be so great that only a small volume of work is needed to justify acquisition of the tool. There are many instances where a machine will pay for itself in a short time, in which case every division or gang may justifiably be equipped with it if it can be used frequently on the class of work to which it is adapted, even if it may not be used constantly. It is not debatable that it is desirable to obtain a high factor of use in order to secure as large a return as possible on the investment. Often, by a judicious programming of work on different districts, tools or equipment may be transferred from one territory to another so as to be used to the maximum.

Machines should be studied to determine if they can be used on work other than that for which they were developed primarily. Much work equipment now in use is quite flexible and has great adaptability. Machines that were developed primarily for track work or paint spraying can often be used to advantage on bridge work and thus can be kept at work beyond the seasons in which the work for which they were designed can be done.

All of this leads to the thought that possibly the greatest problem in the utilization of work equipment is education as to its range of application, use and care, with the last item giving the most concern. All too often men using machines consider that they need no attention and that they will run without any care, with the result that there are abuses, breakdowns, expensive repairs and idle time which might have been productive. Practically all manufacturers furnish instructions which are easily understood for the care and operation of their machines. Yet operators will often disregard simple rules governing adjustments, lubrication, or protection in cold weather. This inattention may result in having to send a rush order for repair parts, in the sending out of a mechanic, or possibly the despatch of the machine to the shop.

An adequate supervisory force with efficient inspectors to supervise machine operations is essential. Such a force, keeping in touch with equipment, can detect improper operation and inadequate care, can make light repairs and adjustments in the field, and can carry on an educational campaign which will greatly reduce breakdowns, expensive repairs and idle time.

A complete record, description and repair part lists of all work equipment and its movements is a great aid to the supervisory force in combating these difficulties. Improper use can often be detected from the nature of repair parts ordered and an investigation started which will eliminate a repetition of the abuse. Also, improper or inadequate description of parts ordered can be discovered, corrected quickly, and improper shipments avoided.

Difficulties can be minimized by close contact with the manufacturer. His advice should be obtained on new applications and the operation of the machine as well as methods to insure the prompt receipt of repair parts.

A complete record of the present location of all work equipment, its past and present accomplishments and the work that it is expected to do during the year, is valuable to the management, since only by a system of programming can a more general and intensive utilization of the machines be obtained.

Get Them Off the Track

By A. A. MILLER
Engineer Maintenance of Way, Missouri Pacific, St. Louis, Mo.

IN a general way, my thought is that we face the problems:

1. Of improving the design of work equipment already in use; this follows naturally with the knowledge of the weaknesses that develop in the operation of the equipment.

2. Of designing and developing new work equipment to be used in fields where such equipment is not yet used and where it is possible to make efficient use of it.

Under the normal increase in business that can be expected in a developing country, together with the requirement of expediting the movement of such business, it becomes more necessary all the while to bring to a minimum the possibility of delaying the movement of traffic; under the very best of operations, work equipment handled on the rails occasionally causes delays to traffic. With signaling and other facilities that aid in the safe and expeditious handling of business on single track, there is a strong tendency to get out of a stretch of single track, from the viewpoint of handling traffic, all that is possible before undertaking the construction of additional tracks. To meet the results of this policy, we must reduce to a minimum, particularly on single track, the use of work equipment that must be handled on the rails.

I think, therefore, that there is a need now for the design and development of work equipment that will do a wide variety of work, without having to make use of the rails. The development of pile drivers, ditching machines, ballast discing and cleaning machines, etc., that can accomplish such work without the use of work trains is desirable. The tractor-mounted equipment might be basic in the development of machinery and work equipment of this kind. Most of our ditching machines of the present must not only occupy the rails, but require a work train for their operation. I can see the possibility of developing machinery that would make the use of a work train unnecessary and would thus function without occupying a track. In my opinion, a study along these lines would quickly bring to light many other pieces of work equipment that must now be handled on the rails by a work train, that might be replaced by work equipment working without making use of the track to accomplish the results desired.

The Value of Equipment

Below- The Mechanic's End of the Repair Building at Batavia, N. Y. At the Left- Where Carpenter Repair Work is Done at Batavia

FEW roads have a clearer conception of the value of machines and work equipment for carrying out arduous and expensive maintenance of way operations than the New York Central, and, as a result, few roads have equipped their track and bridge and building forces more thoroughly than this road. Furthermore, and in spite of the adverse weather conditions which prevail over practically all of its lines during the winter, it can be said that few roads have been more successful in their efforts to get the maximum return out of their maintenance of way equipment.

To keep maintenance equipment busy is one of the important problems taken on with the purchase of the equipment, particularly in northern climates where many phases of maintenance work are seasonal, and one which must be given primary consideration if a road is to be justified in making large investments in such equipment. This fact was recognized early by the New York Central, and has not been lost sight of as its investment in maintenance equipment has increased from year to year. In fact, one of the most important instructions to all maintenance of way supervisory officers, and one which is brought constantly to their attention, is to get the most out of every unit of equipment while it is working, and work it just as much of the time as is possible.

Many Factors Have Bearing on Results

The success which is being attained on the New York Central in this regard may be attributed to a number of factors. Among these are the care taken in the selection of new equipment and, where possible, the adapting of equipment to diversified operations through the provision of auxiliary units or attachments; the concentration of certain types of equipment in large track organizations where it can be used most effectively; the shifting of certain other types of equipment from one division or subdivision to another as needed, or in accordance with a definite program; care in the selection and training of operators; and a carefully carried out and closely supervised system of repairs. Added to these, and of no small importance, is the constant pressure which is brought to bear on all maintenance of way supervisory officers to give the use and up-keep of their equipment primary consideration, to the end that a maximum return will be obtained from the investment in it.

Several roads have built up special organizations which are made definitely responsible for the assignment, operation and maintenance of all roadway machines and units of work equipment, but the New York Central has found that most satisfactory results in all of the above matters, even to general overhauling and repair of the equipment, can be secured by placing the responsibility for each unit of equipment definitely upon the local organization to which it is assigned, with authority and direction over it centered largely in the division officers. The details of the system and methods employed on the New York Central are well illustrated on its lines east of Buffalo, N. Y., and, therefore, this article will deal largely with that portion of the road. Here, each division, and through it each subdivision, is given practically complete jurisdiction over the equipment assigned to it, and is held strictly accountable for its efficient performance and up-keep.

The reason for the extended consideration which the New York Central gives to its maintenance equipment is seen in the large amount of such equipment which

Lies in Its Effective Use

A description of the practices on the New York Central where direct responsibility for both operation and repair is imposed directly on the division supervisory officers

it has in service. On the lines east of Buffalo, alone, this equipment includes the following major units:

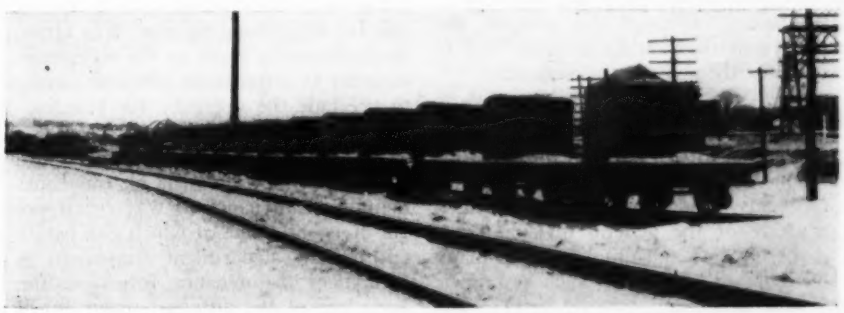
208 Two-tool pneumatic tie tampers, gasoline driven
161 Four-tool pneumatic tie tampers, gasoline driven
14 Four-tool pneumatic tie tampers, electrically driven
9 Eight-tool pneumatic tie tampers, gasoline driven
2 Twelve-tool pneumatic tie tampers, gasoline driven
4 Four-tool electric tie tampers, gasoline driven
2 Four-tool electric tie tampers, power line supply
24 Mole ballast cleaners
959 Track motor cars
4 Track laying machines, gasoline driven
2 1¼-yd. draglines, one oil-engine driven and one gas-engine driven
3 Double-end derrick cars, gasoline driven
27 Single-end derrick cars, steam operated
1 Magnet and gasoline driven generator
1 Tractor scraper
7 Auto trucks
1 Sweeper and derrick truck
7 160-cu. ft. compressors for steel and painting gangs, gasoline driven
1 110-cu. ft. compressor for steel gangs, gasoline driven
2 Track drills, gasoline driven
8 Nut runners, air driven
8 Spike drivers, air driven
8 Spike pullers, air driven
4 Portable, gasoline motor-operated, double-acting diaphragm pumps
11 Locomotive cranes, equipped with pile driver leads, steam hammers, buckets and magnets
9 Power adzing machines
8 American ditchers
11 Paint spraying outfits
1 Sand blast outfit
16 Jordan spreaders
10 Pile drivers
6 Steam shovels
140 Air dump cars
24 Concrete mixers, gasoline driven
1 Tie dapping machine
Pneumatic bridge cleaning tools, such as rotary wire brushes, chipping hammers, etc.
Pneumatic riveters and rivet cutters
Several power-operated wood-working machines and several acetylene torch outfits

All of this equipment is operated and maintained under the general supervision of the chief engineer maintenance of way of the New York Central Railroad and the engineer maintenance of way of the lines, Buffalo and East, assisted by their general staff officers, but, as before stated, the direct responsibility for the equipment rests primarily with the division supervisory officers. The responsibility for purchasing the equipment, in the last analysis, rests with the chief engineer maintenance of way, the engineer maintenance of way and the management, but in most cases, purchases are made as a result of recommendations by the supervisory officers on the divisions, who know their requirements and the specific conditions which must be met.

In practically all cases, however, requests for new or additional equipment must be accompanied by statements showing the justification for the purchases recommended, and, in many cases, exhaustive service tests are required to prove beyond doubt the practicability of the equipment and the economies which it will bring about. As a result, only equipment of the highest grade is purchased, and then only in connection with actual requirements which will show a distinct saving through use of the equipment. Furthermore, by this procedure, the track and bridge and building forces are furnished with equipment which they approve and which can be depended upon to meet their requirements.

As regards the assignment, use and up-keep of equipment, the division supervisory officers are in practically complete control, subject, of course, to general policies or programs laid down by the head office. This applies equally to what may be termed system equipment, such as complete rail-laying outfits, including rail layers, compressors, power spike pullers, spike drivers, nutters, drills, etc., when this equipment is on the division. On the New York Central, therefore, it is the division engineers, their supervisors and the equipment operators themselves who are given direct responsibility for the equipment, it being the thought that by delegating this responsibility from the bottom up, rather than the top down, greater incentive is created among the men actually in charge of the equipment.

Among the well established instructions concerning maintenance equipment on this road, possibly the one given the most attention is to keep the equipment efficiently employed as much of the time as is possible, and particularly during the working seasons, so as to do the greatest possible amount of work and to secure the great-

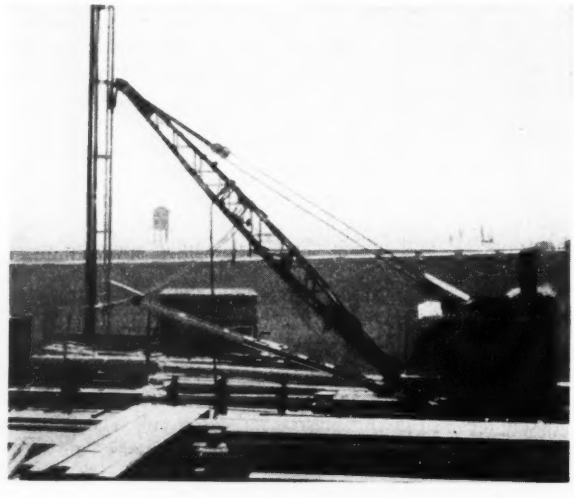


A Long Line of Tie Tamper Compressors, Repaired or Awaiting Repair

est return on the investment in the equipment. That this instruction is given primary consideration is evidenced in many ways, and is even reflected in the character of purchases made. Thus, many units of equipment are favored because of their general utility and adaptability to many classes of work.

From the foregoing list of equipment on the Lines East, it will be noted that the locomotive cranes are equipped with pile driver leads, steam hammers, buckets, and, in some cases, with magnets. This auxiliary equipment greatly increases their scope of usefulness and makes it possible to keep these expensive machines in almost constant use. Likewise, 15 of the derricks on the road are self-propelled and are provided with ½-yd., single-line buckets, adapting them for handling waste, scrap and other miscellaneous materials, as well as for loading and unloading rail, for which they were intended primarily.

Through the provision of suitable auxiliary equipment, the draglines, which are on tractor-type mountings, are used in a wide variety of work, such as excavating, ditching, pile driving, handling culvert pipe into place, erecting steel and many loading and unloading operations. Other equipment has been adapted to new operations in order to keep it busy, as is seen in the use of tie tamper compressors with paint spray and sand blast outfits, and for the operation of pneumatic bridge tools; and the use of steam hammers for demolishing old masonry as well as for driving piles.



One of the Maintenance Department's Locomotive Cranes Equipped With Pile-Driver Leads

Further evidence of the effort to secure the maximum use from equipment is seen in the method of organizing large rail gangs and completely outfitting them with power tools and equipment. Through this practice, the equipment is moved from division to division and is kept employed constantly throughout the season.

Programming Work Extends Use of Equipment

The careful programming of the work on the divisions and on the subdivisions also plays an important part in keeping the equipment busy a maximum amount of time. This is true particularly of the general division track equipment, such as the ditchers and draglines, and many units of bridge and building equipment, such as cranes, pile drivers, bridge tools and paint spraying outfits. Ordinarily, this equipment is employed over the divisions in accordance with well defined schedules, but if a lull should occur in any program, the equipment which would become idle is placed at the service of any of the other divisions which may be able to use it effectively. Likewise, idle equipment which is suitable, is available for use by other departments of the road, and, in fact, the use of certain units of equipment by two or more departments is not uncommon, where such use is necessary to justify the investment in the equipment.

Bridges and buildings are generally repaired in station order to avoid loss of time to equipment and forces in shifting the equipment and men back and forth. The same general procedure applies to painting programs, with the exception that most interior work is reserved for the winter months in order that the equipment may be kept in service throughout the year.

That the equipment is kept busy is made known to the division and system officers through regular work reports, and where efforts are not satisfactory, proper steps are taken to remedy conditions. In other words, every unaccounted for interruption in the use of equipment must be explained, and in a satisfactory manner, or suitable steps are taken. In cases where lack of intensive use of equipment has become apparent, threats to transfer the equipment to another subdivision or division have usually been effective, so anxious are the men to retain their equipment, and in only the most unusual cases has it been necessary actually to remove the equipment in order to reestablish the rule that equipment must be used if it is to be purchased or kept in service.

Operation and Repair Considered Important

In order that the equipment be kept in such shape that there will be a minimum of interruption to its operation during the working season, all operators are selected with the greatest of care and a high standard of up-keep is insisted upon. Care in the selection of operators is given special attention because of the realization that, depending upon the interest and ability of the operators, the equipment will be operated and maintained in either an efficient and intelligent manner, or in an inefficient and careless manner. In many cases the operators are given special training in the operation and maintenance of the equipment to which they are assigned, while in many other instances they secure advance training as assistant or relief operators on the different units of equipment.

The general maintenance and up-keep of all roadway machines and equipment on the New York Central is taken care of by the machine or equipment operators themselves, who are assisted, when necessary, by mechanics or mechanic's helpers, of which there are from one to five on each subdivision. These men, operating under the direction of the different supervisors to whose subdivisions they are assigned, move about over the subdivisions, from machine to machine, and are always on call for emergency repairs. Not infrequently these men do considerable work on the equipment out on the track in order to improve its efficiency, and, at the same time, to preclude the necessity for bringing the equipment in to a definite repair point.

The greater part of the general overhauling of track machines and equipment on the Lines East is done at definite maintenance of way repair points on the different divisions, some of which also handle repairs to bridge and building department equipment. A clear idea of the equipment maintenance forces on the various subdivisions and of the different repair facilities maintained, is best gained from typical illustrations.

On one subdivision, with headquarters at Batavia, N. Y., which has 27 sections and approximately 100 units of maintenance equipment, from compressors to snow plows, definitely assigned to it, the regular repair force of the supervisor for the routine repair of the equipment includes a mechanic and a mechanic's helper. This subdivision maintains and operates one of the smaller maintenance of way repair points, primarily for the handling of general repairs to its own equipment. The repair facilities at this point include essentially a small blacksmith outfit in charge of a blacksmith and helper, and a second small building which is used by the subdivision mechanic and a carpenter in a wide range of repair work.

On another subdivision, with headquarters at Lyons, N. Y., which has 26 sections and about the same amount of equipment as mentioned above, the regular repair force includes two mechanics and three mechanic's helpers. This subdivision also maintains maintenance of way repair facilities, housed principally in two small buildings, one of which is used by a blacksmith and the other by the subdivision mechanics. The building units at this point are somewhat larger than those at Batavia, but this is explained partly by the larger buildings which were available for the repair work, and partly by the fact that Lyons handles all repairs to equipment assigned definitely to two subdivisions, in addition to repairs to a large amount of equipment, such as ditchers, draglines, ballast cleaners, track layers and power track tools, which is considered as general division equipment. Light gas engine repairs are made at all of the different subdivision repair points, but for general overhauling or heavy repairs, such as the reboring of cylinders, practically all gas engine equipment is sent to Beacon and Utica, N. Y., or to Jersey Shore, Pa., where special facilities are provided for handling this class of work.

Subdivision Mechanics Repairing Air Compressors at Lyons, N. Y.

Repairs to B. & B. Equipment

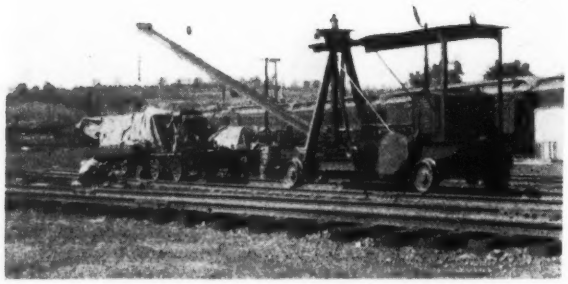
Repairs to bridge and building department equipment are taken care of largely by the maintenance of way repair facilities at Beacon, Utica and Jersey Shore, and at Watertown, N. Y., although some little work on this equipment is done at a number of the other points. A good example of one of the points handling a large amount of bridge and building as well as track equipment repairs, is at Utica, N. Y., at about the midpoint of the Mohawk division. The facilities at this point include electric-operated wood-working machines, drill presses, an engine lathe, a wheel press, a pipe cutting and threading machine and power grinders, and are sufficient to make possible all overhauling work and major repairs, except the heaviest classes of work sometimes necessary on pile drivers, steam shovels, draglines and cranes. All of the heavier work in connection with these larger units is handled by the mechanical department shops at West Albany and Avis, N. Y.

Through this system of making repairs to the equipment on the New York Central, which is more or less the result of the natural growth of repair facilities with the increase in the amount of equipment on this road, the repair work is considerably spread out, but, on the other hand, it is handled largely by the regular mechanics and repair men of the different divisions and subdivisions, who are thoroughly familiar with the equipment, and for which they are largely responsible. Similarly, concentration of repair work under the direct supervision of the different supervisors has a tendency to speed the work and to insure its quality because of the natural interest which these men take in their own equipment, from which they are required to get maximum output during the working season. A further advantage in the New York Central's system of making repairs on the different subdivisions, is that it saves long hauls and the loss of time of the equipment in moving to and from the points of repair.

The advantages of centralized repair facilities are recognized, however, and wherever possible, therefore, the repair of both track and the bridge and building department equipment on several subdivisions is handled at one point. This is evidenced by the more extensive facilities at Beacon, Utica and Jersey Shore.

In order to co-ordinate the individual efforts on the different divisions in the operation, up-keep and repair of the equipment, and to disseminate the best practices which have been developed, all maintenance of way equipment on the Lines East is placed under the general supervision of certain men from the office of the engineer maintenance of way, who spend most of their time on the road. These men have no direct jurisdiction over the assignment and operation of the equipment, but keep in close touch with its condition and make recommendations from time to time concerning its operation and as to what may be necessary at any time to keep it, or to put it, in the best possible condition.

The Care and Repair on the



Rail Laying Outfit Stored for the Night - - Note Mechanics at Work and Covering Provided for Engines

Thorough system, which includes inspectors, mechanics, skilled operators and two system shops, works smoothly and efficiently

CONVINCED of the necessity for and economy resulting from the use of machines for maintenance of way work where suitable machines can be obtained, the Pennsylvania has become one of the most thoroughly equipped roads in the country, having expended in excess of $2,000,000 in roadway machines and work equipment during the last three or four years. With this large investment, which will be increased during 1931 in accordance with a plan to further mechanize arduous and costly maintenance of way operations, many maintenance problems have been minimized or solved, but on the other hand, many new problems of an entirely different nature have been presented.

Among these new problems, which in many cases included the complete revision of maintenance methods and the building up of efficient new work organizations, one of the most outstanding was that of the maintenance and repair of this new equipment. This problem, it was recognized, could not be overlooked or neglected without defeating the purpose of the new equipment and offsetting any advantages to be gained through the large investment in it.

There were many reasons for the importance and magnitude of this problem to the maintenance of way department. In the first place, its men were not mechanics versed in the technic of equipment operation and care, and yet, at the same time, there was the desire to secure all equipment operators directly from the maintenance department whose forces would be affected more or less by its use. Then the whole subject of maintenance of way equipment was relatively new, not alone to the railroad, but to the railway equipment companies as well, and, unavoidably, there were many lessons to be learned, both as regards equipment design and use.

The Pennsylvania gave early recognition to this problem—one, which because of the large amount of pioneering still being done, has not been entirely solved as yet. Beginning at the bottom, it has steadily developed its solution to this problem until at the present time it has a well rounded and co-ordinated maintenance of way equipment organization, from the individual machine operators to the highest engineering officers, which takes in every factor having a bearing on the serviceability and life of equipment from its purchase to the time it is scrapped.

Long List of Equipment in Use

The size of the Pennsylvania's equipment maintenance problem, which is growing from the standpoint of the increase in the amount of equipment involved, but which can be expected to decrease to a certain extent with further experience in the development of equipment and

A Locomotive Crane Undergoing Final Test at Renovo, Following a Complete Overhauling in the Shop

# of Equipment Pennsylvania

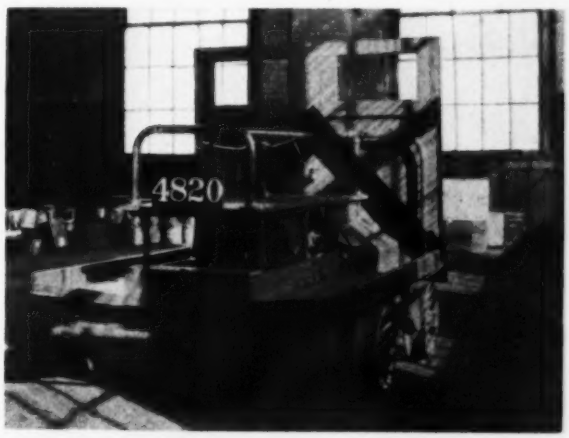
greater experience in its care and use, is best evidenced by the following list of the major units of roadway machines and work equipment employed on the system during 1930:

Power adzers	3
Power ballasters	2
Power bonding drills	65
Clamshell buckets	161
Drag-line buckets	15
Side-dump cars	149
Cars, power	7
Cranes, locomotive, special, 10-ton	4
Cranes, crawler, gasoline-operated, 8-ton	69
Cranes, crawler, gasoline-operated, 5-ton	26
Air compressors with tractors	3
Air compressors	22
Concrete mixers, ½-yd.	2
Concrete mixers, 7-cu. ft.	73
Dipper, crawler type, 8-ton	2
Power jacks	1
Magnets	33
Mowing machines (track)	4
Mowing machines (farm)	6
Mowers, lawn, power	1
Ballast machine (Brownhoist)	1
Mole ballast machines	57
Mole with border attachment	1
Mole transfer trucks	19
Milling machines	12
Paving breakers	3
Pile drivers	17
Paint-spray outfits (motor car)	29
Rail layers (Madden)	35
Rail layers (Burro)	13
Rail drills, power	44
Spike drivers, power	10
Spike pullers, power	4
Spreaders (Jordan)	18
Sweepers, track	1
Tie-tamping outfits (electric)	31
Tie-tamping outfits (Wolfe)	4
Tie-tamping outfits, 12-tool (pneumatic)	88
Tractors with sweepers	3
Tractor bulldozers	1
Trucks, crane type	1
Trucks, auto, 1½-ton	8
Trucks, auto, 2½-ton	31
Weeder and discer	2
Wrenches, track (pneumatic)	8
Wrenches, track (electric)	5

Supervisory Organization Worked Out

As set forth in a manual of instructions (M. W. 52) covering maintenance of way equipment on the Pennsylvania, the chief engineer, represented directly by the assistant chief engineer maintenance, exercises general supervision over all maintenance of way machinery on the system. Under him come the chief engineers maintenance of way of the Eastern, Central and Western regions and the New York zone; then the engineers maintenance of way of the various general divisions, and then the division engineers of the different superintendent's divisions, each of whom exercises general supervision over all maintenance machinery under his jurisdiction. In addition, the division engineers must see that all concerned are governed by the rules and regulations for the maintenance and the safe and efficient operation of all machines.

Under this general supervisory organization, which reaches over the entire system, there are a number of important subdivisions which look after the details of tests, recommendations for purchase, operation, inspection, maintenance and general repair of all maintenance equipment, these including (1) a committee on maintenance of way and structures roadway machines and work equipment, which consists of system and regional representatives; (2) general inspectors with field, office and shop duties, who represent each region; (3) track supervisors, master carpenters, master plumbers, master masons, supervisors of signals, maintenance of way repairmen, and the machine operators themselves, who represent the different division engineers. Each of these groups of men plays an important part in the efficient handling of the maintenance equipment, but attention will



A Track Motor Car Which Has Been Fully Repaired and Repainted

be given largely to those matters handled by these groups which bear more particularly on the maintenance and repair of the equipment. Consideration will also be given to the part played by the mechanical department in this regard, especially in connection with major repairs and general overhauling work, which are carried out under the direction of this department at two large shops.

Special Equipment Committee

One of the most important groups in the maintenance of equipment organization is the committee on maintenance of way and structures roadway machines and work equipment, which is made up of a representive of the chief engineer, a representative of each regional chief engineer maintenance of way, and the assistant engineer of standards, who acts as chairman. As a whole, this committee, which meets about once a month at different points on the system as prearranged, has some important duties and functions. In the first place, it passes upon all maintenance equipment offered to the railroad, basing its decisions and recommendations upon the need for the equipment, its practicability and, in most instances, upon actual tests conducted under its supervision. All new equipment, having satisfied the committee in all respects and having received its approval, is given further consideration by the mechanical department under the direction of the chief of motive power, which views the equip-

ment primarily from a mechanical standpoint. With the approval of this department, which prepares all specifications for work equipment, new machines and devices are put on the "accepted list" and are considered eligible for purchase.

Great importance is attached to this procedure in connection with the purchase of new equipment, it being felt that the care exercised in this regard has resulted in the purchase only of equipment actually needed and suited to maintenance work; and not only that, but equipment which will stand up under actual working conditions without excessive attention and repairs.

Another important function of the committee is in originating and approving requisitions for new equipment. Any supervisory officer in the maintenance of way department, from track supervisor and master carpenter up, can recommend the purchase of new or additional equipment, and this is the usual procedure; such recommendations, or requisitions resulting therefrom, follow a routine course to the committee where approval must be secured before serious consideration is given to the matter by the assistant chief engineer maintenance and the chief engineer. Acting in this capacity, the committee becomes a clearing house for all equipment purchases, assuring that only approved equipment is purchased; that only bonafide needs are considered, and that there is equitable distribution of equipment among the various districts of the road in accordance with their needs and the appropriations available.

Repaired and Unrepaired Equipment Neatly Stored Between Two of the Wings of the Renovo Shop

Inspectors and Mechanics Provided

Individually, the regional representatives on the system committee act in behalf of their respective regions under the chief engineer maintenance of the regions. In this capacity they handle the routine in connection with all matters pertaining to maintenance equipment, including recommendations for purchase, operation, maintenance and repair. From the standpoint of inspection, maintenance and repair, each regional representative is represented in the field by a general inspector whose duty it is to move about over the region during the working season and report the condition in which the various units of equipment are found. These reports are made individually for each machine visited on special report forms and are sent regularly as prepared to the respective regional headquarters. In this way a comprehensive statement is made possible on the regions, showing the condition of all machines and recommendations as regards general repairs or overhauling.

Routine or running repairs to equipment are made by maintenance of way repairmen, of which there are from one to five on each division, depending upon the amount of equipment on the division. In some cases, these men are assigned to a certain class of equipment, as, for example, gasoline engine-driven equipment, so that they can specialize in a particular line and thereby become more proficient. These men are always on call to make or to aid in emergency repairs so that a minimum of delay will be occasioned to maintenance operations and forces during the working season due to minor breakdowns in the field.

In addition to the division repairmen, a mechanic is usually assigned directly to the large rail-train organizations which have been built up during the last few years on the Pennsylvania. With the full complement of mechanical equipment with which these special organizations are fitted, the services of a trained mechanic have proved highly desirable to keep all of the equipment in good working condition.

Operators Selected with Care

No small part of the Pennsylvania's success in the care and up-keep of its equipment has been due to the care exercised in the selection and training of operators. Practically all operators' positions are advertised on the divisions on which positions are open, so that the most experienced men will be attracted to the vacancies. All applicants for positions are examined carefully and only the best of those qualifying are selected. Many of these men have had specific training as mechanics, while many others, prior to their selection as operators, have become thoroughly schooled in the operation and care of certain units of equipment through apprenticeship under regular operators. As a result, an unusually able class of operators has been secured, but as further assurance of "best practices" in connection with the operation of maintenance machines, the system committee has issued a manual of instruction covering the operation, repair and upkeep of the major units of equipment. This manual, which contains 63 pages and is bound in pocket size, is

distributed to all equipment operators and division supervisory officers, who are required to become fully conversant with its contents.

Detailed Instructions

Following a number of general instructions, such as "It is the duty of every operator to provide himself with a manufacturer's instruction book and parts list and to study them until thoroughly familiar with them," and "The first duty of every man in charge of or operating a machine is to keep it clean," the first part of the manual deals largely with the operation and care of motor cars and other gasoline engine-driven equipment. Following this, the different units of roadway machines and work equipment are taken up and dealt with specifically.

One of the noticeable features of the manual is the prominence given to the subject of proper operation and care, and particularly to lubrication; the instructions in this latter regard going so far as to specify the exact grease or oil, by specification and storehouse stock numbers, which should be used on the different parts of the various machines. Tinkering or tampering with machines by operators is prohibited, particularly as regards the more delicate adjustments, unless they are absolutely positive that these adjustments are required and that they are competent to make them.

One of the noticeable features of the system for the upkeep and running repair of equipment, and particularly with regard to securing repair parts, is the lack of red tape which so often is allowed to cause long and expensive delay to equipment and maintenance operations. Recognizing the value of keeping the equipment busy during the working season, particularly if engaged in actual operations, every reasonable expedient is provided to facilitate the repair of a temporarily disabled unit. If the aid of a division repairman is required in an emergency, the operator or gang foreman can call him through his immediate supervisory officer, or, in the absence of such officer, can call him direct and arrange for his services. Likewise, emergency repair parts can be arranged for by telephone, either by supervisory officers on the divisions or by the operators of the equipment itself.

If a minor part is needed urgently, the order for it, giving name and number of part according to manufacturer's list, is telephoned directly to the storehouse or shop where such parts are kept. If it is in stock, it is rushed to the machine by truck or passenger train, as seems most expedient, so that minimum delay in the operation of the machine will result. This procedure also applies in the case of many larger parts, and, as a matter of fact, whole gasoline engine units for the mole ballast cleaners, several of which are kept in stock, have been sent out promptly on verbal request from supervisory officers. In the case of all such requests, however, the stores department or shop furnishing the repair parts forwards one part of a five-part material shipping form to those who have ordered the parts for acknowledgment of the receipt of the parts.

If the parts requested are not in stock at a storehouse where request is made, the request is relayed to other storehouses with the hope of securing the parts promptly. If the parts are not available at any of the storehouses and are such as are manufactured at the Altoona shops of the road, a telephone or telegraph request is made direct to Altoona. On the other hand, if the parts are available only from a supply company or manufacturer and the stores department holds a blanket purchase order covering the parts, it may order direct from the company concerned by wire, mail or phone, and request that the parts be sent promptly to the point where they are required. Where blanket requisitions are not in force, outside purchases are handled through the purchasing department in Philadelphia where special consideration is given to the purchase of repair parts required urgently.

A View Though the Machine Bay of the Renovo Shop

In all of the various arrangements set up to enable the securing of repair parts with the least loss of time, the accounting features are given careful attention, but these details are not allowed to interfere with the prompt dispatch of needed parts to disabled equipment in the field. It is hardly necessary to say that, through this system, which has worked out successfully between the maintenance of way and stores departments, many serious interruptions in the operation of maintenance equipment have been curtailed or entirely prevented.

Two System Shops

Practically all heavy repairs to and general overhauling of maintenance equipment on the Pennsylvania is done in two system shops, one located at Fort Wayne,

Ind., which handles equipment from the Western region and a part of the Central region, and the other at Renovo, Pa., which handles all equipment from the New York zone, the Eastern region, and that part of the Central region not served by the Fort Wayne shop.

In view of the general similarity of the two shops and the fact that, under ordinary conditions the Renovo shop handles a larger number of maintenance units, attention will be confined to it. This shop, which is located about midway between Harrisburg, Pa., and Buffalo, N. Y., on the Washington-Buffalo line, was, until a few years ago, one of the principal locomotive and car repair points on the system. In recent years, however, with the consolidation of mechanical department repair facilities, and likewise, the repair points for maintenance of way equipment, a large part of the engine and car repairs handled formerly at this point have been replaced by repair work on maintenance equipment.

The principal facilities at Renovo include an enginehouse, a large coaling trestle, a back shop with its erecting, machine and boiler shop bays, a two-part car shop, separated by a transfer table, a blacksmith shop and a storehouse. The enginehouse and coaling facilities are still used exclusively by the motive power department, but the other buildings, while handling some motive power work, are now used chiefly for maintenance equipment repairs.

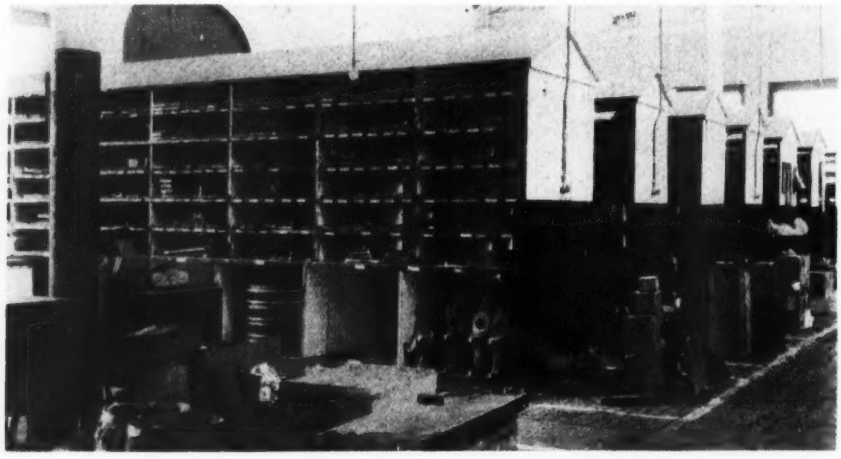
In effecting the changes at the shop, many of the back shop machine tools were moved into a section of the enginehouse, and many changes were made in the arrangement of other tools in the back and car shops to better adapt them to the new class of work taken on. This resulted in a completely revised layout, in which each type of maintenance equipment is handled separately, with the various operations involved carefully scheduled to secure the most effective work. In many cases, the progressive system of repairs is employed, the different units moving along from position to position from the time they enter the shop until they are turned out fully repaired and repainted.

Shop Handles Many Classes of Repairs

The back shop, which consists of a long head bay, used formerly as an erecting bay, and three large wings extending to the north, used formerly as machine shops and a boiler shop, now handles the repairs to many units of maintenance equipment. All cranes, derricks and other large units are repaired in the erecting shop, where large capacity traveling cranes greatly facilitate the dismantling and assembly work. At the present time, the Pennsylvania's large Brownhoist ballast cleaning machine in in this shop being thoroughly overhauled for the resumption of operations in the spring.

The old boiler shop wing is now suitably segregated into areas for sheetmetal work, boiler and truck work, and for general repairs to mole ballast cleaning machines, air compressors, auto trucks, concrete mixers, crane buckets and a number of auxiliary pieces of equipment. Half of one of the old machine shop bays is occupied by machine tools and an electrical department, while the other half forms a progressive bay for the complete repair of track motor cars. In this latter bay, all gas engine work is carried out in a thoroughly equipped shop enclosed by wire caging, while repairs to the car bodies, frames and under-rigging are made in successive stages within well defined areas. At the end of the repair and assembly line, the overhauled engines are replaced in the car frames and the cars are repainted, ready for road duty.

The other machine shop bay of the back shop is now occupied largely by a storeroom, but suitable space is provided for crane cylinder work, welding work, and for the repair and fitting up of a number of miscellaneous units of equipment, such as mowing machines and power track and bonding drills. A large annex to this bay, which was used formerly as a tool room, is now used for the repair of such equipment as tie tampers, track and bridge jacks, vises and work equipment pumps.



A Section of the Maintenance Storehouse at Renovo

Both units of the car shop at Renovo are still used to some extent for repairs to revenue service cars, but adequate space is now available for making repairs to work-train and camp car equipment. In fact, the cars for two complete heavy maintenance trains for the Eastern region were rebuilt and fully equipped in this shop. In addition to space given over to car stalls in both units of the shop, one end of the more westerly unit is used as a woodworking mill and furniture repair shop, while one end of the more easterly unit is used primarily for repairs to such equipment as hand cars, push cars, motor cars, trailers and freight house trucks. The blacksmith shop at Renovo continues as such and handles all smith work in connection with both mechanical and maintenance of way department repairs.

All maintenance repair work at Renovo is handled under the direction of the mechanical department, but with the co-operation and assistance of the maintenance of way department, which is represented by an engineer

maintenance of way, special duty, who also has charge of the Pennsylvania's reclamation plant at Chambersburg, Pa. In addition, the general inspector of maintenance of way machinery for the Eastern region is located at the shop during the winter months and serves in an advisory capacity where needed. This man, through the engineer maintenance of way, special duty, also keeps the regional maintenance offices advised of the status of the work at the shop through weekly reports on all roadway machines there, supplementing a daily report furnished by the mechanical department with regard to repairs on all heavy work equipment, such as cranes and derricks.

In special cases, where new or particularly complicated equipment with which the shop forces are not familiar is sent to the shops, an operator or general foreman thoroughly familiar with the equipment is sent to the shop to assist in the repairs. An example is the presence in the shop at the present time, of the general foreman in charge of the Brownhoist ballast cleaning machine and its operation, who is supervising all repairs being made to it.

Large Amount of Equipment Handled

The extent of the maintenance equipment operations at Renovo is best seen in the following list of the more important units of roadway machines and work equipment which were handled through the shop during the four months, December, 1929, through March, 1930, the busiest months of the year at the shop:

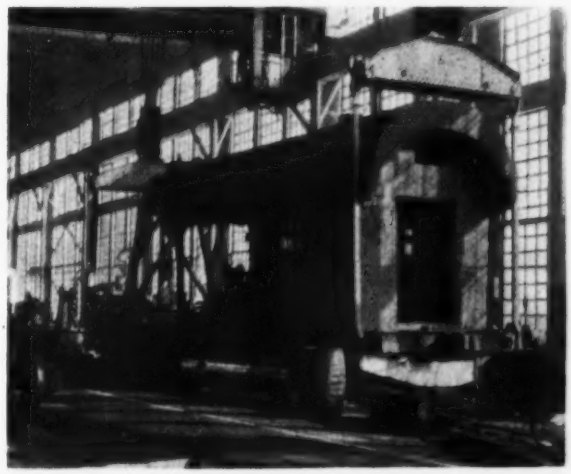
Tie-tamper compressors (12-tool)	60
Tie-tamper guns	1103
Tie-tamper machines (electric)	4
Tie-tamper guns (electric)	24
Mole ballast machines	56
Motor cars	92
Concrete mixers	17
Power mowers	5
Locomotive cranes (steam)	26
Locomtive cranes (gasoline)	2
Steam ditchers	10
Crawler cranes	3
Spreaders	2

All equipment needing repair is scheduled to the shop in accordance with a general program worked out between the different regions using the shop, and a detailed program is prepared monthly on each region. In this way, each region is taken care of equitably at the shop, appropriations are not exceeded and the equipment is consigned to the shops in an orderly manner.

All Mole ballast cleaners are automatically sent to the shop at the end of the working season, usually about the first of November, but work on them is done only in accordance with the monthly shop schedules. Practically all other equipment to receive general overhauling is held on the divisions until scheduled into the shop, at which time it is shipped to the shop on instructions originating at the region headquarters.

Light Repairs Done on Divisions

Equipment not requiring overhauling or needing only running repairs, is held on the divisions and suitably housed for the winter, usually in available shop or section buildings. Where equipment must be stored in the open, it is protected against the weather as far as possible. This includes the draining of all water from tanks and cooling

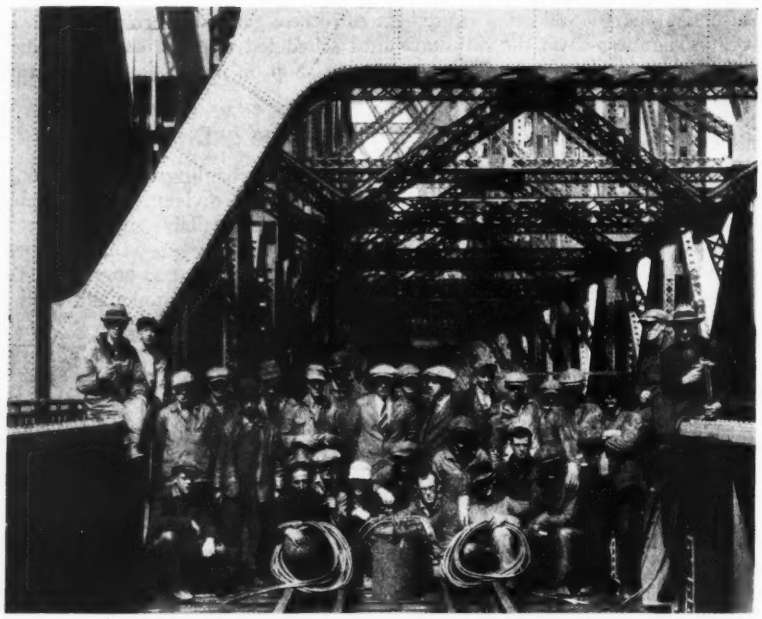


A Steam Derrick Undergoing Heavy Repairs in the Erecting Bay of the Renovo Shop

systems, greasing or oiling all working parts, locking all covers and tool boxes, and covering all exposed engines with canvas. Running repairs required at the end of the working season are performed on the divisions by the division mechanics, this affording a means of keeping these men employed profitably when road work is relatively light.

As the units of equipment are repaired at the Renovo shop, they are stored under cover or in the open as facilities provide, and are held until shipping orders are received from the different regions. Upon the receipt of such orders, the equipment is shipped to the points designated, complete and tested, ready for service. Ordinarily the same units of equipment are returned to the points from which they are received, but this is not an inviolable rule, since all equipment leaving the shop is expected to be in a more or less similar state of serviceability.

Southern Pacific Passenger Station at Sacramento, Cal.



Single coat requires 7,500 gal. of paint and three years' work with a crew of 40 men using paint spraying equipment

E. S. Piton, Bridge and Building Master (in the Center with the Striped Tie) and His Paint Gang

Painting the Quebec Bridge

a Man-Size Job

WHETHER considered from the standpoint of size, difficulties presented or methods employed, probably the most outstanding and interesting railway bridge painting project on the North American continent is the Quebec bridge of the Canadian National over the St. Lawrence river, near Quebec, Canada. This bridge, which is of the cantilever type and has the longest and heaviest riveted span of any bridge in the world, contains 66,480 tons of structural steel, the surface of which requires 7,500 gal. of paint for a single coat, while 70 gal. of paint are required for a single coat for each of the four main posts.

Special features of interest in connection with the painting of the bridge are the use of a chromate content paint, green in color, and the fact that, in spite of the use of up-to-date spray painting equipment on most of the work, and a working season extending from the middle of May until the last week in September of each year, it requires three years to give the bridge a single coat. Other features of interest are the unusual difficulties encountered in the work, including the hazard of working from 100 ft. to 405 ft. above the river, and the favorable results which have been accomplished by the methods employed during the last four years.

Details of Bridge

The Quebec bridge, which has two main cantilever arms supporting a through truss suspended span over the river channel, is a two-track structure, with two 5-ft. sidewalks, and a 16-ft. roadway between the tracks. This bridge, which was completed in September, 1917, forms a link connecting the Canadian National lines on the south shore of the St. Lawrence river with those on the north, and shortens the railway mileage from Winnipeg to Halifax by about 200 miles.

In order that one unfamiliar with the bridge may fully sense its size and the magnitude of the work involved in its maintenance, as well as the hazards, the following dimensions are given:

Length of suspended span	640 ft.
Length of cantilever arms	580 ft.
Length of anchor arms	515 ft.
Total length of steel work	3,239 ft.
Distance center to center of main span	1,800 ft.
Width center to center of main trusses	88 ft.
Width center to center of railway tracks	32 ft. 6 in.
Depth center to center of chords of suspended span at center	110 ft.
Depth of suspended span at hip	70 ft.
Depth of cantilever arm at end	70 ft.
Height of main posts, center to center of pins	310 ft.
Depth of anchor arms at anchor piers	70 ft.
Height of suspended span above high water	150 ft.
Height of suspended span above low water	172 ft.
Height of south main pier above foundation	128 ft.
Height of north main pier above foundation	108 ft.
Height of south anchor pier above foundation	141 ft.
Height of north anchor pier above foundation	160 ft.

The Forth bridge, over the Firth of Forth in Scotland, with which the Quebec bridge may be readily compared because of its similarity of type, has an overall length of 7,870 ft. 8 in., with two clear spans of 1,700 ft. each. Other details of this bridge, which was completed in March, 1890, are included in an article which appeared in *Railway Engineering and Maintenance* for October, 1930.

Maintenance work on the Quebec bridge to the present

time has been largely one of painting. Up to 1926 spot painting had been sufficient to keep the structure fully protected, the work being done with a relatively small force of men, using the brush method exclusively.

In 1926, however, it was deemed advisable to start a regular program of painting, designed to keep the bridge in uniformly good condition. In formulating this program, the most careful consideration was given to the method of procedure, equipment, organization and character of paint, in order to insure the most effective protection to the bridge at minimum cost. The program laid out was made to extend over a period of five years, four years to be utilized in the application of one coat, and the fifth year given over to a detailed inspection of the bridge and the filling of all joints or other places which might allow water to get in and cause corrosion.

The maintenance of such a program, particularly in view of the relatively short season favorable to painting work in the St. Lawrence valley, dictated the use of paint spraying equipment to as large an extent as possible, if it could be proved to be effective and economical, in order to preclude the large force of brush painters which would be necessary otherwise. Extensive tests on the bridge proved the adaptability and effectiveness of spray painting for at least 80 per cent of the work, and this method was, therefore, adopted.

The first large scale operations with paint spray equipment were started in 1927 after about 25 per cent of the season's work had been completed, when five two-gun outfits were put in service. These outfits, which are still in use, and have since been supplemented by an additional two-gun outfit, were furnished by the De Vilbiss Company. Each outfit, in addition to the two guns, includes essentially a 14-gal. pressure paint tank equipped with an air-operated agitator, and suitable lengths of air and paint hose. Air for the operation of all of the guns is provided by an Ingersoll-Rand tie tamper compressor, which has a capacity of 160 cu. ft. of air per min.

A Paint Sprayer in Use

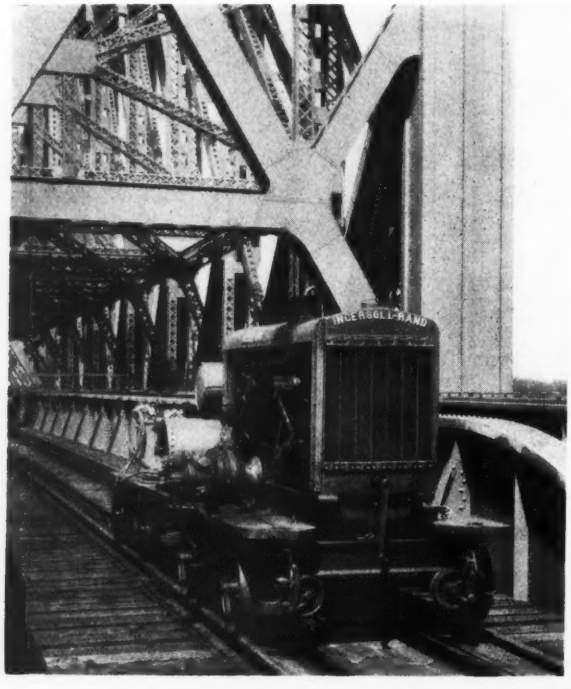
Little Cleaning Necessary

In painting the Quebec bridge, the work is carried across the bridge from one end, taking in both trusses, the floor system and the interior bracing as the work progresses. Cleaning, scraping and spot painting sufficient to keep the full painting equipment busy for about a month is the first work undertaken each year. Upon the completion of this work, the painting is started and brought up with the cleaning work, following which the cleaning work is again carried forward a month or so in advance of the painting work. While cleaning operations are being carried out, the spray painting equipment is thoroughly overhauled and the scaffolding and ropes are carefully gone over and repaired or replaced. When painting operations are resumed, therefore, everything is in readiness.

Owing to the care which has been given to the bridge since its construction and, to a certain extent, to the

The Quebec Bridge, 7,500 Gal. of Paint Are Required to Give it One Coat

fact that the deck members are not subject to the attack of any appreciable quantity of brine drippings, relatively little cleaning and scraping work has been necessary, requiring only a week or two of the time of the painting crew, two or three times a season. No scaffolds or power tools are used in this work, the men finding it more convenient and quicker to crawl about over the bridge members and do such cleaning and scraping as may be necessary with wire brushes and simple hand scrapers of different designs. All spot painting is done with brushes, using red lead, and follows closely behind the cleaning.



The Power Plant of the Painting Gang at the East Portal of the Bridge

Extensive Use of Scaffolding

Painting of the bridge is done with both the paint spraying equipment and brushes, although the brush work on the bridge is only a relatively small proportion of all of the painting and is confined largely to the interior lattice bracing between the trusses. Regardless of the method of painting, scaffolding is required for the major part of the work, this being of the suspended type, largely with block and tackle hoisting and lowering arrangements to facilitate its adjustment.

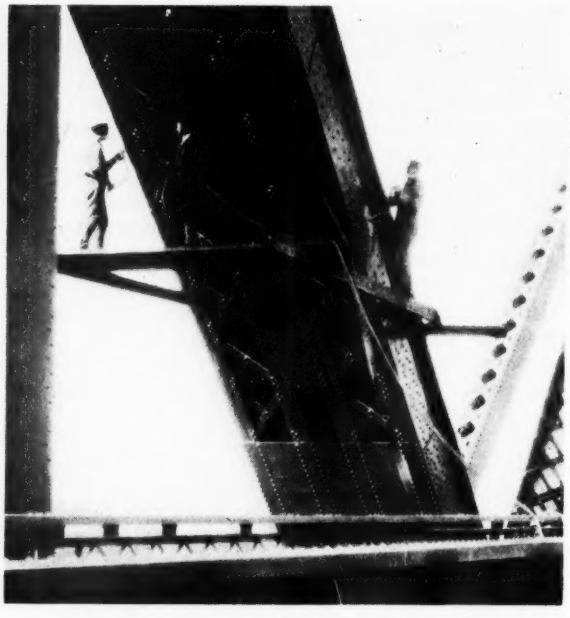
The scaffolding used is entirely of timber, made as light as possible, and framed together with, or supplied with, eye-bolts to provide convenient and secure hitching points for the supporting ropes. Of necessity the scaffolding assumes many different forms and shapes to serve best in enabling the painters to reach the greatest areas with safety. This factor requires more than ordinary skill on the part of those arranging and hanging the scaffolding and has led to the most careful inspection of all scaffolds before the painters are allowed on them.

Minor adjustments of the scaffolding are made by the painters during painting operations, but all changing of the locations of scaffolds is done by a separate crew of men, which, in fact, keeps scaffolding erected in advance of the painters so as not to delay painting operations. The work of the scaffold crew is greatly facilitated and speeded up by the provision of an air-operated winch on the rear of the air compressor car, which is used in all of the heavier hoisting and lowering operations.

Through the skill of the scaffold men who have been employed on the bridge, and the rigid inspection made of all scaffolding, not a scaffold failure has occurred in the painting work. In fact, not a single accident has occurred to any of the painting crew, a record which is most significant in view of the hazards involved.

Spray Painting

In the spray painting work the air compressor stands on the more easterly of the two bridge tracks, which is not used for traffic, and the six pressure paint containers are scattered about on, above or below the deck in close proximity to the points where actual painting is going on. The men with the spray guns supplied from each tank usually work near each other, and each gun operator is assisted by a helper who holds and insures free movement of the paint and air hose. At many points the helper is not necessary but, ordinarily, his assistance gives a wider range of operation and greater freedom of movement to the gun operator and, incidentally, eliminates the setting up and adjusting of a lot of scaffolding. Frequently, too, the helpers take over the paint guns to relieve the regular painters and, in this way, an excess of capable gun operation is always available.



Spray Painting One of the Main Truss Diagonals from Adjustable Scaffolding

All of the gun operators are equipped with goggles and respirators, but these are generally used only when working in confined areas or where the operators are subject to spray carried by the wind. One precaution taken consistently by the gun operators to protect their skin and to facilitate cleaning up after work is to coat their hands and face with vaseline before starting work each day.

With a relief operator for each paint gun and the scaffolding kept placed in advance of the work, all 12 guns of the paint spraying equipment are kept busy practically continuously throughout the day. As a further effort to this end, filled pressure containers with the

paint thoroughly mixed by the mechanical mixers within them, are always kept available to replace those employed in the painting work. These containers are hoisted about the bridge to the points desired by means of the air-operated winch on the platform of the compressor, and thereby, a replenished supply of paint is furnished to the guns with little physical effort and with minimum delay to their operation. Two spare guns are also kept on hand to change out any guns which may give trouble.

Winds, Fogs and Mists

In addition to the hazardous nature of a large part of the work of painting the bridge and the difficulties which this involves, several other difficulties are encountered in the painting work. Possibly the most important of these are presented by the strong winds which sweep down the St. Lawrence and the frequent heavy fogs or early morning mists which hang over the river valley. Both of these factors increase the hazards of the work and add to the difficulty of securing the best quality of painting.

In many cases, wind of sufficient force to interfere seriously with the most effective use of the paint spraying equipment has made it necessary to shift the work to better protected parts of the bridge, and, in some cases, it has been necessary to give up the use of the paint guns entirely. Ordinarily, however, with such broad expanses of steel as are found in many of the bridge members, it is possible to continue work with the spray guns at certain places regardless of wind conditions.

Many of the bridge members and plates are from two feet to ten feet wide and, if sheltered at all, can be painted with little difficulty in a considerable wind. The broad expanses of the through plate girders of the deck system and the interiors of large box members with one or two lattice sides also present surfaces which can be painted effectively when the wind would interfere with painting in fully exposed or unshielded areas. Usually, therefore, painting of these larger members with the guns is reserved for weather less favorable for spray painting the smaller members or those exposed to heavy wind. When it is desirable to curtail the use of the spray guns for a period of time because of wind conditions, the painters and helpers generally revert to the use of brushes and catch up with the painting of the lattice box members forming the interior bracing system of the bridge.

Fog and mist present the greatest difficulty early in the morning, usually in that they wet the steelwork and necessitate delay in getting started with the painting, sometimes until noon. The fact that all of the bridge members are well ventilated, however, greatly speeds up the drying action of the sun and wind and permits painting much sooner than would be possible if this feature of design had not been incorporated in the bridge design.

In view of the magnitude of the painting operations described and the widespread general interest of the public in viewing and photographing the bridge, the most careful consideration has been given to the quality of paint used and to the general appearance of the bridge structure. Primarily in this latter regard, a paint, olive green in color, is used, which harmonizes most effectively with the surrounding landscape and tends to soften the long bold lines of the steelwork. Widespread favorable comment from the thousands of tourists who visit the bridge each year bespeak the general appreciation and approval of the effort to enhance the appearance of the bridge by the use of the green paint.

Working on the Deck in Windy Weather—Note Men Wearing Respirators—Work on Floor Girders Is Done at Times When High Winds Do Not Permit of Painting the More Exposed Portions of the Bridge

A study of the paints best suited to the bridge from the standpoint of durability led to the use of chromate in the pigment as a rust preventive, and resulted in the adoption of the following formula for the pigment as a whole:

	Per Cent By Weight
Basic lead sulphate (min.)	54.0
Zinc oxide (min.)	20.0
Chromium oxide (min.)	3.0
Basic lead chromate (min.)	2.0
Lamp black (max.)	0.5
French ochre (approx.)	3.0
Asbestine or other inert material approved	15.0
Total calcium carbonate and calcium sulphate shall not exceed	2.0

The composition of the paint as a whole, by weight is given in the following:

	Per Cent by Weight	
	General Painting	Patching
Pigment (as above)	58-62	62-66
Raw linseed oil	20-21	18-19
Boiled linseed oil	16-17	14-15
Japan dryer	5	5

Paints of other formulae have been used on the bridge, more or less as tests, the most prominent being one con-

taining a carbonate in the pigment. The greatest satisfaction is being secured from paint of the above formula, however, and it is likely that paint of this character will continue to be used in the future. All paint under the formulae or specifications issued is purchased ready-mixed in five-gallon drums, a manner which has been found most convenient for handling in the work. Not only that, but purchase is made in this size container because of the more thorough mixing that is obtained than when paint is purchased in larger drums or barrels.

Forty Men in Painting Crew

Owing to the extent of the work of painting the bridge and the limited working season each year, the painting force is maintained at about 40 men, a relatively large force under ordinary circumstances for the operation of 12 paint spray guns. On the other hand, as has been pointed out, there is an unusual amount of auxiliary work in connection with the painting of the bridge, including the brush work and the arranging of scaffolding, which makes necessary a larger force than would be required ordinarily. In addition, helpers on the deck increase the size of the force, but these men, who replenish the supplies of the painters in addition to carrying out considerable auxiliary work, save a large amount of the time of the painters in climbing back and forth over the bridge in filling their own requirements for materials.

The normal make-up of the painting force on the bridge is as follows:

1 Foreman.
1 Assistant foreman.
12 Painters.
12 Painter helpers.
5 Men employed in moving and adjusting scaffolding.
3 Helpers on the bridge deck, handling supplies.
1 Mechanic, who is in charge of the air compressor and who also repairs and regulates the paint spraying equipment.
1 Blacksmith, who has charge of the material store and who makes and sharpens all of the scraping tools used on the work, and also makes all scaffold forgings.
2 Watchmen, who look after the equipment at night, since it is left out on the bridge continually to save the time and expense of bringing it in to a storage point each night.
1 Timekeeper, who keeps the records of the painting force.

In addition, one man is employed as a boatman and is required to row about under that part of the structure where the men are working. The boat is equipped with life preservers for use in case more than one man should fall from the bridge at the same time.

The force as outlined is maintained throughout the working season, altered in arrangement from time to time, depending upon the character of work being done. At the close of the working season, as many of the men are absorbed into the regular maintenance forces of the road as is possible in order to hold them for the bridge painting work of the following year. This applies particularly to the painters, their helpers and the scaffold men, who become more proficient with increased experience in the work on the bridge, and who present much less of an accident hazard than new men.

Spray Method Shows Saving

In view of the fact that out-of-face painting of the bridge has never been done entirely by the brush method, it is impossible to compare by actual figures the cost of the spray painting work with that of brush painting. Neither is it possible to state accurately the size of the brush painting force that would be necessary to accomplish an amount of work equivalent to that effected by the spray painting force of 40 men. Such comparable data as are available, however, indicate that a force employing the brush painting method exclusively would have to be three or four times as large as the spraying force, and that the cost of work would be increased materially.

An analysis of the cost of the painting work carried out during 1927, in which year 10 paint guns were put in operation after about 25 per cent of the season's work had been done by the brush method, shows that the labor cost of applying the paint amounted to $7.14 per gallon, this including all auxiliary items such as scraping and spot painting. In 1928, in which year the spray painting method was used exclusively, except in painting the inside bracing, the labor cost of the spray painting alone amounted to $2.83 a gallon, while the total cost of painting, including all items except the cost of the paint, was $5.34 a gallon of paint applied to the bridge.

Amount of Paint Applied

Records of the complete four-year painting program, from 1926 through 1929, show how the paint spraying equipment has increased the amount of work accomplished. In 1926, with a large brush painting force, 1,762 gal. of paint were applied. In 1927, owing to the curtailment of the painting program, only 896 gal. of paint were applied, in spite of the fact that 10 paint spray guns were put in operation that year after about 25 per cent of the work had been completed. In 1928, with the same paint spraying equipment, 2,073 gal. of paint were applied to the bridge, and in 1929, with 12 spray guns in operation, 2,765 gal. of paint were applied, completing the single-coat painting of the bridge, which, altogether, involved the application of 7,496 gal. of paint.

The quality of the work which has been done with the spraying equipment is said to be excellent. It is admitted that there is some loss of paint in using this method, particularly when working on small members unprotected from the wind, but it is felt that this loss is small and that it is more than compensated for by the speed and economy with which the paint is applied.

The painting of the Quebec bridge is done under the general direction of T. T. Irving, chief engineer, and C. P. Disney, bridge engineer, Central region of the Canadian National, and under the direct supervision of E. S. Piton, bridge and building master.

Eagle Nest Tunnel, Chicago, Milwaukee, St. Paul & Pacific

It Was From Such Primitive Devices as This That Our Modern Power Equipment Was Evolved

Manufacturers Make Progress

Supply companies continue efforts to improve equipment designed to take the drudgery out of maintenance work

WHAT was the outstanding development of the past 12 months in the field of power tools and equipment? In so far as this question relates to specific appliances, it must remain unanswered, because it is doubtful if any group of maintenance of way officers could come to agreement on any single device. As a matter of fact, no power tool or machine was announced during the last year to perform some important item of work that had not previously been done by mechanical means. In other words, there were no epoch-making innovations like the introduction of the first power tie-tamper, the first motor car, the spike driver or the tie adzer.

Yet the year that has passed since the last exhibit of the National Railway Appliances Association has been one of marked advance in power equipment. Many manufacturers have announced the perfection of improved models, extensively modified designs, or extensions of their lines to include a wider range of capacities or sizes. Such development follows no general rule, being evolved in each field to meet the particular or peculiar demands as they arise. As a consequence the changes or improvements in some lines will be more pronounced during one year than in some other field, but from a study of the progress that has been made, it should be found possible to obtain a general idea of the prevailing tendencies in power appliances in maintenance of way work.

Rail Grinders

As a case in point, attention may be directed to the development in appliances for the surfacing of rail heads and the dressing of rail ends, an evidence of the increasing attention that is being given the condition of the running surface of rails at the joints. No less than three wheel or truck-mounted surface grinders were brought out during the year in addition to two small power-operated hand grinders. But the significant trend is to be found in the introduction of three rail-end dressers of the grinder type, in addition to a hand-operated shaper designed to accomplish the same purpose, namely to cut a small bevel in the running surface at the joint.

Of course such devices had their origin in the need for a suitable means of finishing the ends of rail joints that are being built up by welding processes, but it is significant that devices to perform this operation have been brought into being just at the time when there is a growing appreciation of the ill effects of end-flow of the metal in the running surface of rail. Chipped ends are now rather generally recognized as one of the contributing factors in the battering of rail joints, but no conclusive data are available upon which to base any definite opinion as to the effect that a consistent removal of fins will have on the ability of rails to resist batter. Here is a field for experimentation that may lead to greater use of devices of the kind referred to above.

Spike Pullers and Drivers

Power tools for the driving and pulling of spikes have done much to expedite the renewal of rails, and have probably been responsible for as great a reduction in the expenditure of manual labor in this major maintenance operation as the introduction of the power rail cranes. There has been a feeling on the part of some maintenance of way officers, however, that the equipment originally offered for this service would be subjected to marked improvement with the accumulation of experience in their use. The correctness of these observations has been borne out by subsequent events. Thus, during the last year, a manufacturer of pneumatic tools has brought out a revised design of spike puller that is equipped with small wheels to permit it to be rolled along the rail and thus eliminate the lifting of the tool from one tie to the next. The same firm has also introduced a tool carrier mounted on an air compressor car which provides overhead supports for spike drivers or other tools that are being supplied with power by the compressor.

An effort to meet the oft-raised objection to the need of starting spikes to be driven by power spikers is seen in a new car-mounted machine driven by a gasoline engine, which is designed to drive automatically spikes that are fed into position for driving from a magazine. Another manufacturer has introduced an appliance, similar-

ly powered and mounted, that is equipped with individually-mounted pullers to draw spikes on both sides of the rail simultaneously. A manufacturer of electric tampers has introduced a screw-spike or lag-screw driver, a power nut runner and a reversible bolt tightener.

Advance in tamping tools during the past 12 months appears to have been confined to the attainment of greater refinement in design, new models of both pneumatic and electric tampers having been introduced. Greater innovations were made in the power plant. It is probably not a mere coincidence that new designs of both a small compressor and an electric generator were brought out, each equipped to be rolled along one rail on casters. Both are two-tool machines and are clearly intended to meet the requirements of mobility for spot work by small gangs. Here, perhaps, is one answer to the problem of power tampers for work normally done by section gangs.

In the case of the larger air compressors, several producers have offered improved designs, some in car mountings for tamper operation and others on small wheel trucks for general service. A company producing electric tampers, on the other hand, is now offering portable gas engine-generators in five sizes ranging from 3½ to 20 kv.a. capacity.

Motor Cars

The track motor car industry is now so well established and has passed so far beyond the experimental stage that drastic changes in design are no longer to be expected. In some respects it occupies somewhat the same status as the automobile industry, yearly models embodying rather moderate changes in design being the order of the day. At the same time, these minor revisions have made for steady improvement, with the result that the motor car of today is a far more efficient and reliable maintenance of way utility than it was 10 or 15 years ago.

At the same time, the influence of highway vehicle practice is apparent in current trends in track-motor-car design. Perhaps the most extreme manifestation of this is the recent announcement of a motor-car speedometer. However, a more general tendency is to be found in the fact that three manufacturers are now selling cars equipped with Ford Model A engines, while two more cars were introduced during the last year that embodied four-cycle engines with selective speed and reversing gears, and electric starting, ignition and lighting equipment. In spite of these tendencies, however, the cars for light inspection and ordinary gang service still conform in large part to the rather stabilized design exemplified by the use of the two-cycle engine.

The subject of motor cars suggests their adaptation to equipment for burning weeds. From primitive machines designed to burn weeds in a swath no wider than the ballast section, there have been evolved burners of varied models constructed for a wide range of service. Development of the past year by two manufacturers has been applied to designs embodying further use of extension arms that not only increase the width of the swath that may be burned, but also afford greater economy in the use of fuel and flexibility of operation. Machines are now available that will consume weeds over a width of 46 ft. The smaller outfits are mounted on a single car, while some of the larger units consist of two four-wheel units. Weed-burning machines have also been used successfully for melting snow.

In mowing machines, a new one of the motor-car propelled type was introduced and a new manufacturer in the field brought out a manually-propelled, gas-engine-operated mower. This is not intended as a substitute for track operated machines, but rather for use on the right-of-way at a distance from the track. Two new discers, one of which is of a new large size, were announced during the year.

The impetus that was given to the installation of snow melters of the stationary type by the severe winter of 1929-30 has given rise to the introduction of a number of new melters. New models have been offered by manufacturers already in the field and in addition some entirely new makes have been introduced. A manufacturer of gas-burning heaters has introduced two electric heaters, one of the contact type and the other of the radiating type; a maker of oil heaters has introduced a gas heater equipped with electrical igniter, while another company is now offering a new type in which air forced over electrical heating units is blown against the switches or other trackwork to be protected. In this connection it is pertinent to mention a snow-melting powder of German origin that was introduced on American railways during the last three months. Fortunately, or unfortunately, the current winter has been an unfavorable one for the testing of snow-fighting equipment of any kind in most territories where its extensive use is normally required.

In the field of wood-working equipment, mention may be made of the introduction of several new power saws. Most of these are electrically operated. However, one innovation of the year was a saw of the chain type that is equipped with a small gasoline engine. The demand for gas-engine-operated tools was met also by a new track drill. However, with a growing appreciation of the advantages of power tools for bridge and building field work, there is a definite tendency to provide power plants supplying compressed air or electric current. In work on wooden bridges electrically-operated tools are in special favor, but there are as yet no substitutes for pneumatic riveters, buckers and rivet busters, and the compressor is also an essential for paint spraying. Among other devices, two concrete breakers embodying an important change in design, were recently introduced.

Excavating Machines and Cranes

The power crane and shovel industry is unique in that consolidations of manufacturers do not seem to have resulted in a reduction in the number of makes of machines on the market. As a result, new designs of locomotive or automotive cranes, shovels and dragline excavators are being introduced from month to month. A study of these new models does not indicate any definite trend of design other than the continued popularity of the crawler tread. One exception to this rule is observed in a truck-mounted crane which has been received with considerable favor by an eastern road that has used it extensively in terminal work. The gasoline engine continues to be the most popular power unit, although the Diesel engine is gaining increased favor.

New designs of drag-line and clamshell buckets were introduced during the year, and two manufacturers introduced large capacity cars, (70-tons), one a side-dump car for grading and ditching service and the other a ballast car. The trend toward larger cars is indicated by the use of 122 thirty-yard side-dump cars on temporary grading tracks in a large terminal project at Cincinnati.

A review of equipment developments of the year would not be complete without a brief reference to the introduction into maintenance operations, such as ditching, of a variety of unusual grading machines and spoil-carrying equipment that were developed originally for heavy grading jobs. These appliances depend for their propulsion on a caterpillar-mounted automotive unit and for that reason have proved useful in maintenance work because their use obviates occupancy of tracks.

On the Klamath Falls—Alturas Line of the Southern Pacific

Proving Their Worth

Service data demonstrating the economies accruing from the use of mechanical appliances

NOTHING demonstrates the merits of any device so effectively as specific service data showing definitely what work the machine performed and the cost incurred. Unfortunately, the records from which such information may be compiled are not often kept and even when made a matter of record, are not always available for publication. Some appliances, also, are obviously of such a nature that the economies which they produce do not lend themselves to exact determination.

However, because we felt that such information would be of the utmost interest and value to both the manufacturer and the user, we invited the co-operation of manufacturers of appliances used for the maintenance of railway tracks, bridges, buildings and water-service facilities to supply us with any information of this nature that they could consistently permit us to publish. Such information as was obtained is presented on this and following pages.

Power Ballaster Speeds Tamping

INTERESTING records of performance are reflected in reports of a number of roads on their experiences with the Jackson power track ballaster, series N-131, sold and serviced by the Maintenance Equipment Company, Chicago. The minimum average speed of operation of the ballaster, as shown in these reports, has been about 410 ft. an hour and the maximum speed attained has been 735 ft. an hour, the speed depending to a certain extent on the type of ballast, the raise given the track and the number of blows struck by the shoes in each crib. The high record was made on an eastern road where an average raise of 6 in. was made on stone ballast and where from 4 to 5 blows were struck in each crib. The average rate of speed in this case was 600 ft. an hour.

On a western road where the average raise was 6 in. on rock ballast and where 4 blows were struck to a crib, 3,680 ft. of track was tamped in 6 hr. or an average of about 613 ft. an hour. On this job the ballaster was accompanied by a gang of 40 men renewing ties at the rate of about 150 a mile. On still another road where the raise was from 6 to 8 in. on stone ballast, 3,300 ft. of track was tamped in an 8-hr. day by a gang of 12 men equipped with a Jackson power ballaster and a Nordberg power jack.

Jackson Power Ballasters in Operation

On a southern road where the raise was 2½ in. on gravel ballast and where 7 blows were struck in each crib, the average speed of tamping was about 475 ft. an hour. On another project where it was necessary to raise the track from 2 to 6 in. on ungraded gypsum ballast con-

taining large, tough lumps, a maximum of 3,200 ft. of track was tamped daily by a power ballaster, striking 7 or 8 blows in each crib. A new type of tamping bar was used on this job and the gang consisted of 24 Mexicans.

On all of the above roads it is reported that the settlement of track tamped with the power ballaster has been uniform and only about 25 per cent of that of track tamped by hand. It has also been found that the cost of tamping with the power ballaster is only about one-third of the cost of hand methods, including all charges. It is indicated further that the cost of maintaining power-tamped track is considerably less than the maintenance of hand-tamped track.

Economy in Burning Weeds and Melting Snow

FIGURES showing the efficiency and economy of destroying weeds with modern equipment were obtained by a large road during its 1930 weed-killing operations with Giant Octopus weed-burning machines of the Woolery Machine Company, Minneapolis, Minn. It will be recalled that these machines may be used with either three or five tube burners, depending on the exigencies of the particular case.

The program of this road involved the killing of weeds over a total of 1,109 miles of tracks, on 398 miles of which conditions were such as to require the use of a five-burner machine, while three burners sufficed for the remaining 711 miles. The cost of burning weeds on the former mileage was $3.65 a mile, and on the latter $3.16 a mile, the combined average cost of destroying the weeds over the entire 1,109 miles being $3.34 a mile. The following is an itemized statement of the average cost per mile, separated between the three burner and five-burner machines:

Item	Three Tube Burners	Five Tube Burners	Weighted Average
Gallons of distillate per mile	22.8	40.2	29.0
Cost of distillate per mile	$0.87	$1.59	$1.128
Gallons of gasoline per mile	0.99	1.07	1.03
Cost of gasoline per mile	$0.132	$0.143	$0.136
Operators' salary and expenses per mile	0.70	0.82	0.745
Repairs and misc. per mile	0.33	0.13	0.26
Wages of trackmen per mile	1.13	.97	1.01
Total cost per mile	$3.16	$3.65	$3.34

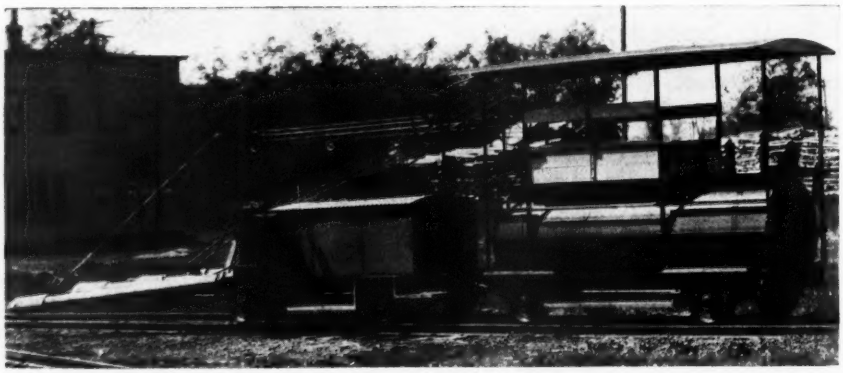
Figures showing the performance of a Woolery Midget Octopus two-burner weed-destroying machine in snow and ice melting duty are no less interesting. A careful record of the work accomplished by one of these machines on a leading transfer road showed that, during 2¾ hr. of working time, the machine cleaned 67 switches, 3 double-slip switches, 2 railway crossings and 1 highway crossing and flanged 3 miles of track. At this location the snow was from 4 to 5 in. deep on the level, and in some places was drifted to a depth of about 18 in. The crew, consisting of an operator and helper, started work at 10:30 a. m. and quit at 3:00 p. m., taking one hour for lunch. In addition switching engines caused 45 min. delay, leaving 2¾ hr. in which the machine was in actual operation.

Speed in Driving Screw Spikes

USING an electric screw-spike driving outfit of the Syntron Company, Pittsburgh, Pa., a crew of 15 men on a northern road, while working under traffic, recently drove 1,760 screw spikes for lagging tie plates to the ties in 3½ hours, or an average of 503 an hour. The road on which this was accomplished follows the practice of laying rail in the winter, and the rail had been laid on

A Screw-Spike Driving Crew Using Syntron Electrical Equipment

new tie plates and gaged with cut spikes several days prior to setting the lag screw spikes. The equipment employed consisted of a portable gasoline-operated electric power plant, six electric wood drills for drilling holes in the ties and two electric screw-spike wrenches for running down the spikes. Experience has shown that the most efficient ratio of drills to spike-drivers is three to



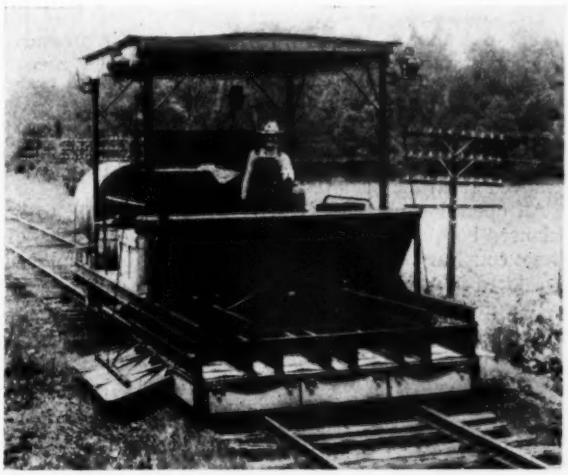
A Woolery Three-Burner Giant Octopus Weed-Destroying Machine

one. A detailed description of this Syntron electric screw-spike driver and the electric wood drill was presented in the August, 1930, issue of *Railway Engineering and Maintenance*.

The spike-driving crew was composed of six drillers or one for each drill, four spike-driver operators or two to each driver, one power-plant operator, two men for handling the cables and two men to shovel snow from the tie plates. Setting the spikes involved the removal of the power plant once to a new location, handling the cables, removing the snow from the tie plates, drilling the holes and driving the spikes. The speed of driving that was attained by this equipment and organization was said to have been possible because of the compact size of the power plant and the speed of operation of the tie drills and the screw-spike drivers.

Burning Weeds on the Milwaukee

DURING the past year the Chicago, Milwaukee, St. Paul & Pacific burned the weeds on 4,299 miles of its tracks at an average cost of $3.71 a mile, with an oven-type weed burner supplied by Fairmont Railway Motors, Fairmont, Minn. The burner was operated prin-



Fairmont Burner of the Type Used on the Milwaukee

cipally on the Southern Minnesota division between La Crosse, Wis., and Wessington Springs, S. D., although it was also operated over small mileages on three other divisions. The total mileage involved in this weed burning program was 1,164, and the weed burner was operated over various portions of this mileage from two to six times throughout the season. The cost of operating the burner per mile is summarized as follows:

Wages of pilot	$ .38
Wages of operator	.47
Wages of section laborers	1.16
Fuel oil	1.32
Gasoline and lubricant	.10
Rental and repairs	.28
Average cost per mile	$3.71

In addition to the weed burner proper, the outfit consisted of two push cars pulled by a section motor car, on which were carried a pressure tank, an air compressor, 14 water barrels and two lengths of ¾-in. hose. This outfit was capable of sprinkling the right of way over its entire width in the event of fire.

The crew operating this machine consisted of an operator, a conductor pilot and four track laborers to extinguish fires. The schedule regulations did not require that the conductor pilot perform any duties in connection with the operation of the equipment, although generally he assisted the operator in various ways.

Power Saws Effect Savings

ACTUAL performance records of the Wolf portable timber sawing machines, which are manufactured by the Reed-Prentice Corporation, Worcester, Mass., show that a considerable saving in time and labor can be effected by their use in a wide range of bridge and building work.

On a southwestern road which used one of these units, powered with an Ingersoll-Rand air motor, in the reconstruction of a trestle that had been destroyed by high water, it was found that two men could operate and handle it with ease and that its speed of operation resulted in a saving of 50 per cent in labor. The timber handled on this project consisted of Oregon pine and the pieces ranged from 12 to 24 in. in maximum dimensions. For the 30 days that a record was kept, no upkeep was necessary.

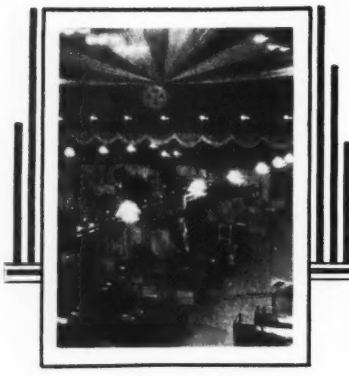
A subsidiary of this road utilizes one of these machines in its timber creosoting plant where the saw has replaced four men, thereby effecting a daily saving of about $16. This saw is powered with an alternating-current motor and is used to cut bridge material ranging from 3 to 13 in.

An Electric-Powered Wolf Saw in Operation in a Timber Treating Plant

in size. Other than the occasional sharpening of the saw and the renewal of the saw chain about every six months, no repairs to this machine have been found necessary.

The original model of the Wolf saw has a capacity of 24 in., but this machine is now also available in special capacities of 16 in., 36 in., and 48 in. In addition to the models operated by compressed air and electric power, a model powered with a gasoline engine is also available.

TEN YEARS AGO—The decline in the freight traffic of the railways has continued until the volume of business being handled has almost set a new low record for recent years. The total number of cars of freight loaded in the four weeks ending January 29 was 2,819,352. This was 14 per cent less cars than were loaded in the same weeks of 1920, and 4 per cent less cars than in those weeks of 1919.—Railway Age, February 11, 1921.

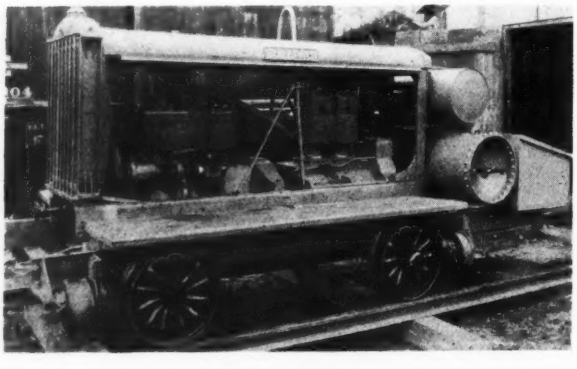


NEW AND IMPROVED DEVICES

New Portable Air Compressor

THE "vibrationless" gasoline-engine driven portable air compressors which the Sullivan Machinery Company, Chicago, has been manufacturing for the construction and municipal fields for some time, have now been made available for railway service in four different units.

The smallest unit has a capacity of four tie-tamping tools while the other three units have capacities of 8, 8 to 12, and 16 tie tampers, respectively. The two smaller units are each equipped with two single-acting cylinders, one being 5½ in. by 5 in., and the other 6½ in. by 5¼ in. The two larger units are each supplied with four cylinders of the same respective sizes, which are placed in pairs at an angle of 90 deg., forming a V type of design.



One of the New Portable Air Compressors

The compressors are direct connected to Buda four-cylinder, four-cycle engines of 23, 34, 46 and 67 hp., respectively.

The engine and compressor are mounted on heavy electric-steel frames, and are equipped with sectional cooling water radiators. Other equipment includes an American Bosch magneto, a Zenith carburetor, an Imperial primer, air filters on both the compressor and the engine intake, a Pierce speed governor and a slow down governor. The compressors are mounted on steel underframes, which are bolted to heavy running gears consisting of three-inch square steel-bar axles with heavy-duty wheels equipped with Alemite lubrication fittings and Hyatt roller bearings.

Each compressor is equipped with a set of cross or unloading double-flange wheels and an eccentric arrangement by means of which the entire unit may be jacked clear of the standard gage rails onto the unloading rails. A special quick-action jack is employed for this work, and the wheels are locked in the desired position by means of pawls. The unloading wheels are also equipped with roller bearings and Alemite grease lubrication fittings. A lifting bail is provided for moving the compressor with a crane and is so designed that it can be engaged directly by a crane hook without the use of chains or a sling.

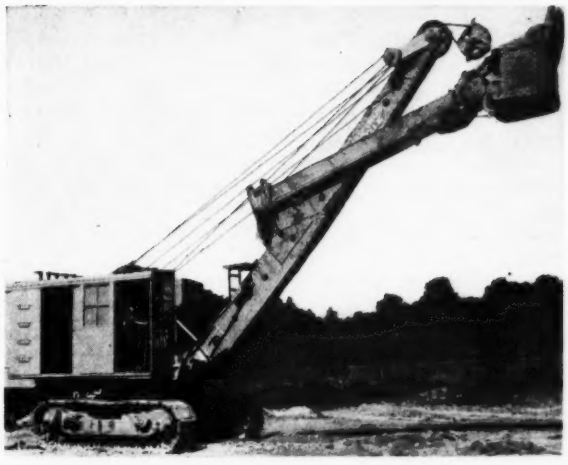
The compressor is controlled under varying load by means of a pilot valve governed by air receiver pressure, which raises the inlet valves from their seats by means of plungers when the demand for air ceases. An automatic engine control by air pressure is interlocked with this system and operates through the carburetor throttle to slow down the engine to idling speed when the load is removed from the compressor.

All operating parts of the compressors are said to be balanced both statically and dynamically, and the type of direct coupling between engine and compressor employed is said to be such that the engine effort is co-ordinated to that of the compressor unit. In addition, an extra flywheel is provided on the compressor shaft, which contributes to the smooth action of the unit at all load points. It is claimed that the working parts and the action of the unit are so balanced as to eliminate vibration.

A New Convertible Machine

THE Bucyrus-Erie Company, Milwaukee, Wis., has recently introduced its 43-B, 1½-1¾-cu. yd. machine convertible to either shovel, dragline, crane or clamshell and designed to secure increased yardage production at a lower unit cost. The machine may be had with either Diesel, gasoline or electric power and with either a rope or chain crowd on the shovel, as desired. In addition it may be fitted with extra long and wide mountings for soft ground dragline work. It is said that the convertibility of this machine from one type of work to another is by the simplest possible means, thereby reducing the time and labor of changing over.

The 43-B is of unit steel construction and is equipped with ball bearings on all continuously running shafts, over-size clutches, gears enclosed and running in oil, a box girder boom, single-shaft-drive caterpillar mountings and over-size brakes equipped with cooling fins. It is said that the machine may be steered from the operator's seat with the cab in any position. The cab is constructed of steel and the operator has an unimpeded view on three sides. Other features of the new machine are a swing brake for operating on grades, a dipper with inserted teeth, two bearings to each shaft, a power dipper



The 43-B with Shovel Equipment

trip, a self-starter for the engines, a self-locking power boom hoist, and double-operating chocking brakes on the caterpillar mountings, which are controlled from the operator's seat.

Nordberg Develops a Cross Grinder

A NEW type of cross grinder, designed primarily for cross-grinding and beveling rail ends has been developed recently by the Nordberg Manufacturing Company, Milwaukee, Wis., This machine, which weighs approximately 300 lb., consists primarily of a 3 or 5 hp. engine mounted over one rail, along which it is run by means of double-flanged wheels. An insulated supporting bar, reaching to the other rail, provides the necessary stability when the machine is in use.

The grinding wheel is attached to a flexible shaft about nine feet long, which permits grinding to be done on either rail, and is driven by means of multiple V-type rubber belts. The length of the shaft makes it possible also to grind any part of an ordinary crossing, a frog or both switch points without the necessity of moving the machine. The freely-held grinding wheel gives maximum flexibility of use. In grinding wide openings at a rail joint, wheels having a thickness of 1/16 in. or 1/8 in. may be used as desired, in which event it is easy to hold the abrasive wheel in such a manner as to grind both rail ends at the same time. The grinding wheels can be changed quickly and easily or a wire brush substituted for cleaning steel or other metal surfaces, or for other similar applications.

In emergencies, the machine can be removed from the track quickly by grasping the supporting arm and tipping it over. The hoop-shaped guards permit it to roll away from the track without damage, when this is done. It can also be lifted off of the track easily by two men, using the handles provided for this purpose. The speed of operation is such that one man can grind from 30 to 40 joints an hour.

A Combination Work Car and Extra-Gang Trailer

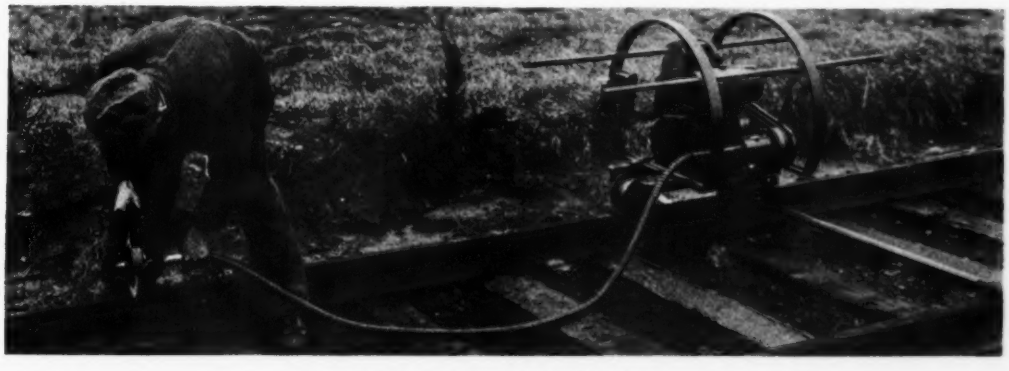
A NEW work car which is quickly convertible into a trailer for the transportation of large gangs has been placed on the market recently by the Northwestern Motor Company, Eau Claire, Wis. The new car, which is designated as Type 500A, is equipped with Timken tapered roller bearings having adjustable anti-lateral thrust collars, while the wheels and axles are identical with those used on the Northwestern Casey Jones 523A standard section motor car.

The car platform has a width of 67 in. and a length of 82 in., while the over-all length is 96 in. and the over-all width is the same as the platform. The wheel base is

The Type 500A Work Car

52 in. and the height of the platform over the rails is 23 in. The frame is constructed of 1½-in. by 5-in. white oak, and is reinforced with one diagonal brace underneath. The deck is protected at each end with a 1½-in. by 1½-in. angle. The drawbar is continuous for the full length of the car and has a draw head at each end. A lift bar, consisting of a one-inch pipe, is provided at each end and extends through the frame and draw head. The capacity of the car is 6,000 lb. and it has a net weight of 600 lb.

Type 500A is so designed that it can be equipped with four-wheel brakes, and is then known as Type 500AB. The addition of foot boards to the latter type converts



Nordberg Cross-Grinding Machine

it into Type 500AC, and the further addition of a seat and safety railings for gang transportation establishes Type 500AD. The seat and safety railings detach as a unit, and it is said that the foot boards and brake rod are easily removed, the reassembling being accomplished with equal facility.

Fairmont Offers Weed Burner in Four Models

FAIRMONT Railway Motors, Fairmont, Minn., is now offering four new models of its M27 weed burner, known as Models D(M27), D1(M27), E(M27) and E1(M27). The M27 weed burner was described in detail in the March, 1927, issue of *Railway Engineering and Maintenance*, and improvements which have been effected from time to time have been outlined in subsequent issues. The original model of this weed burner was a four-wheel, self-propelled unit having a burner oven or hood at the rear, under which were located a number of burners. Eventually the burner was equipped with an extension arm on each side, and the present models are distinguished from each other by the number of burners that the machine carries, either under the hood or on the extension arms.

The greatest variation from previous models is presented in Model D1(M27), in which the oven or fire hood, together with the burners under it, are omitted. However, if desired, these parts may be bolted to the frame at any time. Each of the two extension arms of this model, which swing out to the sides for burning weeds on fills and in cuts and ditches, is provided with two burner heads. The maximum over-all reach of the flame on level ground is 23 ft. from the center of the track. The two burners on each side cover an eight-foot strip at their widest angle and are easily swung to any intermediate position within the 46-ft. burning range. It is said that one man easily controls the single arm on his side, raising and lowering it according to the contour of the ground as the car moves along without stopping. This model also has two burners under the wings, and if necessary it can be used to burn on the track only by swinging the burner arms straight back, and staggering the two burner nozzles on each arm to cover both sides of each rail.

Model D(M27) is a six-burner machine of the hood type having no extension arms or swing burners. Four of the burners are under the hood and the other two are under the wings. This machine burns to a width of 16 ft., although the swing burners can be attached.

Model E(M27) has eight burners, four of which are under the hood, two under the wings and two on the extension arms, each arm being equipped with one burner. This arrangement permits a certain amount of side burning and at the same time allows the maximum efficiency in burning over a 16-ft. width.

Model E1(M27) is a ten-burner unit having two burners on each of the two extension arms, two under the wings and four under the hood. This arrangement permits the fullest efficiency for burning over a 46-ft. width.

The extension burners of these models are also said to be excellently adapted to the melting of snow and ice around switches in large yards, as the machine can stand still or travel as slowly as is necessary.

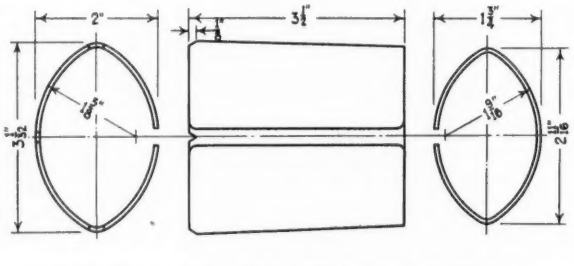
The propelling engine of each of the foregoing models has been equipped with the Autoline electric starter; electric lights have also been provided at the front and rear for deadheading at night.

A Ferrule Wedge for Tool Handles

A FERRULE wedge for holding the tools of standard picks, mattocks, asphalt cutters and adzes to the handles has been developed and placed on the market by the National Lock Washer Company, Newark, N. J. This wedge, which is known as the National ferrule wedge, is made of corrosion-resisting steel and is designed for application on the wood handle within the eye of the tool. It is made in two sizes known as Styles A and B, the former being designed for 3-in. by 2-in. oval handles and the latter for 3-in. by 1-in. oval handles. The wedge is prevented from sliding down the handle of the tool by bending its edges over the head of the handle during insertion.

The ferrule wedge presents a metal surface or armor

The Model D1(M27) Weed Burner



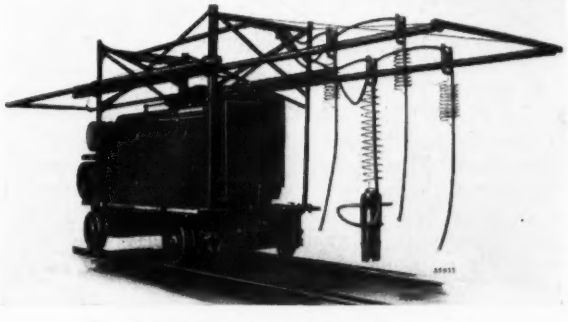
Sketch Drawing of One Style of National Ferrule Wedge

on the wooden handle, which resists wear and distributes the large outward pressure of the compressed wood handle against the entire surface of the eye of the tool. It protects the wood handle from abrasive or sandpaper action and renders possible the restoration of the original tightness of the tool to the handle without loss of the wood in the handle. It is said that with this wedge the tightness of the tool may be maintained over long periods of time and that it may be restored by jamming the top end of the tool down on a solid object.

New Pneumatic Tool Carrier

THE Ingersoll-Rand Company has developed a telescoping carrier frame for application to its different models of tie tamper compressors, which is designed to carry the heavier of its pneumatic track tools, in operating position, within a range of 12 ft. from the ends of the compressor to which it is applied. The carrier as a whole is essentially a steel tower, with telescoping trolley carriers which can be extended both in front of and to the rear of the compressor on which it is mounted. The tower structure consists essentially of four angle posts, which are fastened through base plates to the compressor platform. These angles are rigidly cross-braced on all four sides, and, to prevent vibration, the side cross-braces are themselves braced at the middle by means of a throughbolt and pipe spacer. The ends of the supporting tower are given additional strength at the top by angles.

The telescoping tool carrier, which is seven feet above the compressor platform, consists of two support pipes on each side of the tower, into which telescope the trolley pipes themselves. The support pipes, which are 3 in. in diameter and 12 ft. long, are fixed to each side of the carrier frame by U-bolts. The trolley carriers, one at



The New I-R Tool Carrier in Operating Position

each end, consist of two 2½-in. by 12-ft. pipes, spaced at their outer ends by an angle, which slide into and out of the support pipes. To increase the supporting power of the carriers when they are fully extended, and to prevent possible side sway, the ends of the carriers are given a tie back to the top of the carrier tower by crossed ⅜-in. cables, provided with turnbuckles so that the cable tension may be adjusted readily.

The carriers are kept from slipping back into their supporting pipes by butting them against bolts placed through these pipes, and the support pipes are kept from slipping in their U-bolt holders by means of lugs welded to them on each side of the U-bolts. The total length of the carrier when extended at both ends is 31 ft., while its full length when closed is 12½ ft.

Special trolleys are provided for operation on the trolley carriers, which are designed to support the air hose as well as the pneumatic tools. The tools are suspended from the carriers by means of large coil springs, so designed that when spike puller is hung from one of them, the jaws of the puller are about 14 in. from the ties. Through this arrangement, the compressor can be run along the track without the necessity of loading the spike pullers on to the platform. When spikes are to be pulled, a rope loop, about one foot long, is used between the spring and the puller, which brings the jaws of the tool within about two inches of the ties, so that the puller can be pushed down easily to grab the spikes. By varying the length of the rope loop, other air track tools, such as pneumatic screw spike drivers and nutters, can be readily supported from the trolley springs.

In order to provide for overhead connections for the air hose, a two-inch air header pipe is supplied, which runs from the after-cooler of the compressor to the top of the carrier tower, and thence throughout the length of the tower to its front end. Six ½-in. hose connections and valves are furnished at both the front and rear of this header. Through this arrangement, the hose to the air tools may be cut to length and fitted with connections so that no excess hose need be draped around in the way of the workmen. The total weight of the tool carrier, independent of the hose and tools applied to it, is 1,400 lb.

New Concrete Breakers

A CAM-TYPE design of steel retainer distinguishes two new models of concrete breakers of the Sullivan Machinery Company, Chicago, from previous concrete breakers that have been manufactured by this company. The new models are known as the K-5 and K-6 concrete breakers and are fundamentally similar to Models K-2 and K-4, which were described in detail in the March, 1929, issue of *Railway Engineering and Maintenance*, and which they replace.

The breakers consist essentially of a double-grip handle containing the valve assembly, the push lever throttle and the oil reservoir; a cylinder containing the free-floating valve; and the chuck housing. There are no screw joints, the three principal parts being fastened together with a U-shaped side rod which passes completely around the rear end of the tool, and extends through lugs in the

The K-6 Concrete Breaker

The K-5 Concrete Breaker

side of the chuck housing. Coil springs at the ends of the side rod furnish an equalizing effect so that all parts of the tool are kept tight and in alinement.

The new cam-type steel retainer, which is said to embody simplicity and great strength, is housed in the front

end of the chuck housing. The retainer is locked on the steel by means of a small lever, which is actuated by hand or by the pressure of the foot. This retainer replaces the old type which was shaped somewhat in the form of a U with a guide for the steel at the bottom and trunnions at the sides so that it could be swung back out of the way when changing steels.

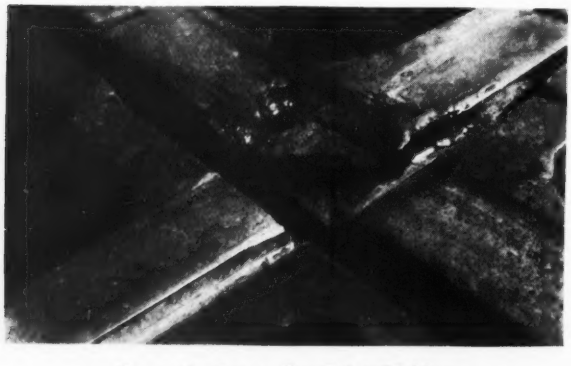
Models K-5 and K-6 weigh 72 lb. and 80 lb. respectively, as compared with 76 and 84 lb. for Models K-2 and K-4. Model K-5 is suited for any except the most severe service while Model K-6 is designed for unusually heavy work. As in the case of the old models, the new concrete breakers may be converted into the Sullivan Q-1 and Q-2 sheet-piling drivers by the substitution of certain front end parts, as was described in the May, 1930, issue of *Railway Engineering and Maintenance*.

Welding Manganese Steel

THE welding of manganese steel presents many problems which are not met in the welding of high-carbon and other forms of steel. The most important of these are the high coefficient of expansion of this metal and the fact that its austenitic structure, upon which many of its peculiar properties are based, is destroyed by slow cooling. The Morrison Railway Supply Corporation, Buffalo, N. Y., has developed a process of welding manganese steel which is said to overcome the difficulties due to expansion and which restores the austenitic structure of the metal after cooling.

The principal application of this process is in the repairing of worn or broken railway crossings and frogs, either in the shop or in the track. It is claimed that, as a result of the methods employed, worn or defective crossings can be reconditioned under traffic at a cost of approximately 23 per cent of that of new crossings, exclusive of the labor required for replacement, and without delaying train movements.

Through the application of the methods used, it is said that it has been possible to restore crossings that were



Corner of a Crossing Frog Before Welding

broken almost in two, and to repair a condition where cracks extended entirely through the section of the flangeways for as much as 20 in. in all four directions from one corner. In some cases, as much as 10 lb. of slag and sand have been removed from defective castings and replaced with good metal. Many of the crossings which this company is repairing have been in service for long periods, so that they are badly battered and chipped. Such crossings are built up to the original section and it it claimed that after they are restored they have substantially the same service life as when new. The corner of the crossing shown in the illustrations required the application of more than 60 lb. of new metal.

Likewise manganese steel frogs can be reconditioned in the track or, if preferred, removed to a shop for restoration, the method being similar to that employed for crossings. The same method is applied also to the welding or open-hearth steel, and is being employed to practically the same extent for the reconditioning of all-rail crossings and frogs.

This company has rebuilt several hundred manganese steel crossings and substantially an equal number of open-hearth crossings, as well as many frogs of both types,

The Same Corner Two Months After Restoration

during the last several years, on 18 trunk line railways. Many of these crossings have been subjected to especially severe service and in numerous instances the rebuilt crossings have demonstrated a longer service life than when originally installed.

Typical examples of crossings reconditioned by this method are those at Twenty-first street and Stewart avenue, Chicago, where the double-track main line of the Illinois Central, whose tracks at this point are also used by main-line trains of the Atchison, Topeka & Santa Fe, crosses the two main tracks of the Pennsylvania at nearly right angles. To complicate matters, a heavy-traffic connection of the Chicago & Western Indiana crosses both of these lines at the point of their intersection, and on a sharp curve. These crossings, which were of manganese construction, were badly worn and broken in several places prior to rebuilding in July, 1930, whereas after approximately eight months' service, they now show practically no signs of wear, although carrying an extremely heavy traffic on all three routes.

The crossing of the Mayfair cutoff of the Chicago & North Western with the main line of the Chicago, Milwaukee, St. Paul & Pacific, at Grayland, Chicago, provides a similar example. Both lines are double tracked and cross at an acute angle. The traffic on both lines is heavy, that on the former consisting almost exclusively of freight, while the latter comprises both freight and high-speed passenger trains. These crossings were in equally as bad shape before rebuilding as those at Stewart avenue, but after nine months' service since being repaired, they show practically no surface wear, although there is some side wear on the points of the end frogs, principally on the Milwaukee route.

A third example of satisfactory service from rebuilt manganese crossings may be found at Cragin Junction, Chicago, where nine badly worn and broken crossings were rebuilt in May, 1930. Heavy traffic main lines of the two roads last mentioned cross here at approximately right angles. All of these crossings show some surface wear, those on one track being slightly more worn than

the others. The present indications are, however, that all of these crossings will remain in usable condition without further attention for three or four years.

Woolery Improves Weed Burners

THE Woolery Machine Company, Minneapolis, Minn., has recently made a number of important improvements to its Giant Octopus three and five burner weed destroying machines and has replaced its Midget Octopus Model W.B.A. two-burner machine with a new model of improved design. The Midget Octopus was described in the March, 1930, issue of *Railway Engineering and Maintenance*, while the larger machines were described in an earlier issue.

The three and five-burner machines are self-propelled two-car units, consisting of a tank car carrying the fuel oil and a burner car on which the power unit is mounted. The burner car may be equipped with either three or five burners as desired. The Midget Octopus is also a self-propelled unit mounted on a single car which carries the fuel-oil tank, the power unit and two burners. This latter weed burner is designed for use on short line roads and around yards and terminals, and is also adaptable to the melting of snow and ice around frogs and switches.

The three and five-burner machines have each been equipped with two Ford Model A industrial engines, one of which is employed to operate the blower and the force-feed fuel-oil pump, while the other propels the machine and operates the fuel-oil pump to fill the tank on the tank car. A four-speed truck transmission provides four speeds in both directions through the agency of a specially designed reverse gear.

In the larger models all flat leather belts have been replaced with the Multiplex V belt, six 5/8-in. V belts being used to drive the blower and two to drive the force-feed fuel-oil pump. The engines, the blower and the pumps are now housed over to protect them from the weather, and the operator's seat is also covered. These machines have also been equipped with a new design of burner head and cap which is said to embody several advantages over the old type. A burner head for melting snow and ice, which can be applied to any of this company's tube or control-type weed burners, has also been developed and is said to have proved successful for this kind of work.

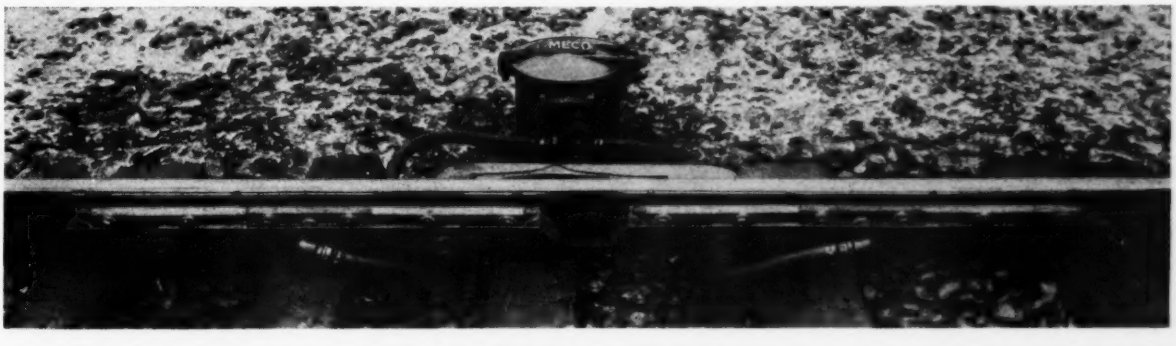
The new Midget Octopus is known as Model W.B.F. It is somewhat heavier than the former model and has 240-lb. wheels with standard M.C.B. flange and tread. This machine is also equipped with a Ford Model A industrial engine, which propels the machine and operates the blower and the force-feed fuel-oil pump. As in the case of the larger machines, the engine is equipped with the four-speed truck transmission, four speeds in reverse being obtained through a specially-designed reverse gear. The blower and oil pump are connected to the engine through a twin-disc clutch. Six 5/8-in. Multiplex V belts are used to drive the blower and two are employed to drive the fuel-oil pump. The engine, the pumps and the blower are enclosed in a housing to protect them from the weather. The operator's seat is also covered and may be enclosed if desired.

The Woolery Model W. B. F. Midget Octopus Two-Burner Weed Destroyer and Snow Melter

Rail Lubricator Improved

DURING the past year the Maintenance Equipment Company, Chicago, has developed and placed on the market the Meco rail and flange lubricator, Type MB, which differs from previous models of this lubricator in details designed to reduce the installation and maintenance costs. This lubricator was described in considerable detail in the May, 1929, issue of *Railway Engineering and Maintenance*.

The Type MB is applied to the rail by means of four clamps which are attached to the base of the rail, whereas



The Type MB Meco Rail and Flange Lubricator

the former model was fastened to the rail by means of five bolts extending through holes drilled in the web of the rail. This lubricator is standard for all rail sections, the only special parts being the clamps which are designed to fit the particular section of rail to which the lubricator is to be attached.

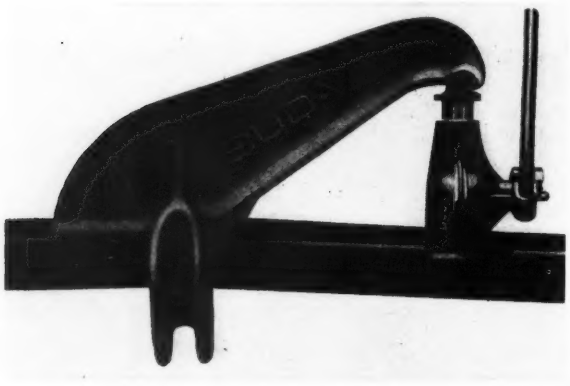
A two-way special cock has also been placed in the lubricant supply line near the container, and permits the full discharge of the lubricant through either hose, so that the four discharge orifices in each of the distributing bars can be cleaned without removing the latter from the machine.

It is said that several manufacturers have developed lubricants for this machine that will function correctly from sub-zero temperatures up to 100 deg. F. without changing the lubricant, although two grades of lubricant, one for summer and another for winter, are furnished by other manufacturers. In one case it was found that a lubricator using an all-year lubricant, operated at —20 deg. F. and at +50 deg. only a few weeks later.

In one case it was found that these lubricators effected a saving in the turning of locomotive tires of about $60 per locomotive per year. It is also reported that the application permits an increase in the tonnage rating of about 10 per cent, where the grades have not been adequately compensated for curvature.

Improves Rail Bender

DURING the past year the Buda Company, Harvey, Ill., has effected a number of improvements in its jack-type rail bender, a short description of which was presented in the March, 1929, issue of *Railway Engineering and Maintenance*. Originally this rail bender was made in two sizes, one of which was designed to bend rails up to 110 lb., while the other had a maximum capacity of 130-lb. rail. The former was known as model



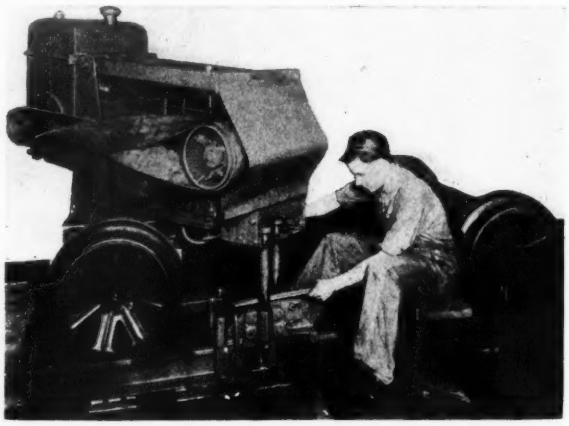
The No. 130 Buda Jack Type Rail Bender

No. 20 and the latter as No. 30. The improved model, which is known as No. 130, is designed to bend all rails up to 135 lb. and replaces both of the previous models. Either a 25-ton or a 35-ton journal jack may be used with the new model; where the former is used the total weight of the unit is 189 lb. and when the latter is used the weight is 196 lb. The casting at the top of the jack has been redesigned to give it a swivel motion with the journal jack so that no binding will occur after the rail has been bent to a considerable angle.

A New Power Spike Driver

A POWER spike driver of new and unusual design has recently been placed on a production basis by the Electric Tamper & Equipment Company, Chicago, after several years of development and testing work. This machine, of which only a limited number are being made at this time, is said to drive from 800 to 1,000 spikes an hour. It is a self-contained unit mounted on a four-wheel truck, and power for its operation is supplied by a 7½-hp. four-cylinder gasoline engine.

The principal working parts consist of two revolving hammers of the type generally employed in drilling rock, which are belt driven from the engine and in turn transmit blows to two plungers which drive the spikes. The plungers, one of which is located on each side of the rail, extend through a mechanism which serves the double pur-



A View of One of the New Power Spike Drivers

pose of squaring the tie plate with the rail and the tie, and of holding the spikes securely in position and alinement while they are being driven. The spikes are fed into the machine automatically by gravity from magazine clips of 50 spikes each. One of these clips is fastened to the mechanism on each side of the rail at the bottom of each plunger.

The gasoline engine, the rotating hammers, which run in oil, and the plungers are mounted in a frame which is swiveled about a king pin near the front axle of the truck. This swivel feature allows the machine to be rotated so that spikes can be driven at either rail as desired. This frame also has a tilting movement and that end of it carrying the plungers and the rotating hammers may be lowered and raised by means of compressed air. This air is supplied by one of the cylinders of the gasoline engine, which is equipped with the proper valves and otherwise designed to compress air. The weight of the rotating hammers and the other parts at one end of the frame is counterbalanced by the weight of the engine at the other end which overhangs the front wheels of the truck. Another unusual feature of this equipment is an automatic gaging device that brings and holds the rails to the proper gage while the spikes are being driven.

The operator's seat is located directly in front of the rear wheels of the truck and is low enough to permit the operator to manipulate conveniently the controls of the spike driver, which are only two in number. One of these is a lever by means of which the spikes are transferred from the clips to the driving position under the plungers, and the other is a throttle by means of which the near end of the machine is lowered by compressed air until

the plungers engage the spikes. The ends of the plungers are recessed to fit the heads of the spikes and it is said that all spikes are driven without bending.

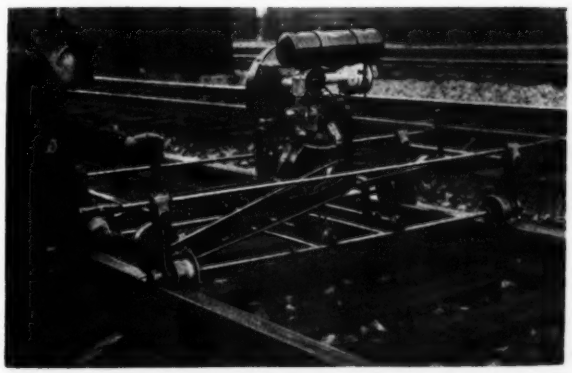
With this device, spikes may be driven simultaneously on both sides of the rail, either opposite each other or staggered as desired, or on one side only. They may be driven tight against the base of the rail or the machine may be adjusted so that a clearance of 1/16 in. or 1/4 in. is left btween the spike and the base of the rail.

An operator and a helper are required to handle one of these machines. The operator remains seated and manipulates the controls of the machine, at the same time propelling the machine from tie to tie by means of one foot. The helper assists the operator in applying the spike clips and sometimes pushes the machine along. He also makes the necessary adjustments to the engine and performs any other duties that may arise in connection with the operation of the spike driver. A box between the rear wheels of the truck carries a supply of loaded clips and is replenished by one who is assigned to this duty.

The number of these machines required in a rail-laying gang depends upon the rapidity with which the rail is laid, but it is thought that two should be used to obtain the best results. In the event that more than one machine is in use, it is only necessary to equip the leading unit with the automatic gaging attachment. This machine weighs about 2,000 lb. and a bail is provided which permits handling by a crane.

A Two-Grinder Machine for Beveling Rail Ends

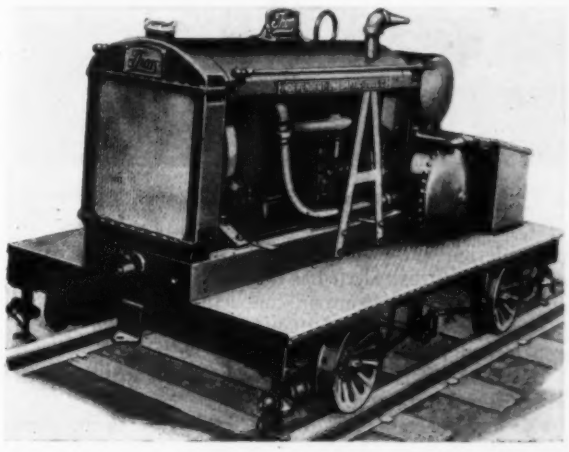
A POWER rail joint grinder for beveling the ends of rails at joints, has been placed on the market recently by the Keystone Grinder & Manufacturing Company, Pittsburgh, Pa. This grinder is a self-contained unit carrying two grinding wheels, one over each rail, mounted on a low four flanged-wheel truck. The grinders are powered with a 5-hp. air-cooled engine which is also mounted on the truck. The machine is insulated so as not to interfere with electric track circuits and is fitted with lifting handles for removing it from the track. It weighs about 200 lb. complete and can be removed from the track by two men in about five seconds. The grinding wheels are made of material that was selected after exhaustive tests and are arranged so the desired bevel on the ends of the rails may be secured accurately and quickly. It is said that this grinder will bevel two joints per minute, including the time required to move from joint to joint.



The New Rail Grinder in Operation

All-Steel Compressors

THE Thor portable air compressors of the Independent Pneumatic Tool Company, Chicago, Ill., which are mounted on rail cars for railway service, have been completely redesigned to eliminate all wood in the construction and the machines are now built entirely of steel. Other than this difference in material, the compressors



The Thor 120-Ft. Capacity Compressor Mounted on a Rail Car

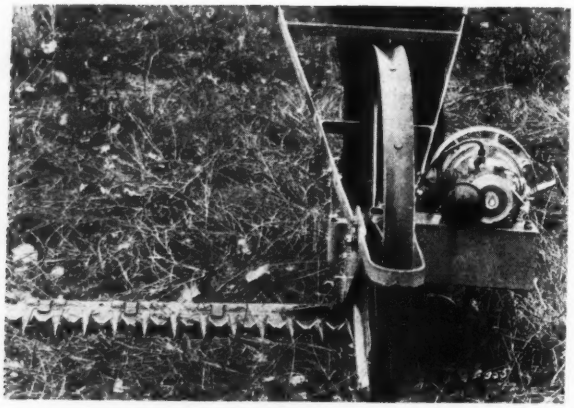
are essentially similar in design to previous models. These compressors are now available for railway service in sizes of 120, 250 and 310 cu. ft. of free air per minute. They may be had in self-propelled or non-self-propelled types. As in the case of previous models, the compressors are equipped with a supercharger which is said to give 26 per cent more air than the conventional compressor. This supercharger was described in detail in the February, 1930, issue of *Railway Engineering and Maintenance*.

Motor Scythe Improved

THE Johnson Motor Company, Waukegan, Ill., has acquired the manufacturing and selling rights of the motor scythe which has hitherto been manufactured by the Rawls Manufacturing Company, and has remodeled and improved the scythe with a view to reducing vibration to a minimum and to increasing the cutting power. Briefly, the scythe consists of a one-wheel frame carrying a small gasoline motor, a cutter bar, a transmission system and a pair of handles similar to plow handles. In the original model, power from the engine was utilized to propel the scythe and to operate the cutter bar, the handles being used only to guide the machine. In the new model the handles are employed to push and guide the machine and the power of the engine is applied only to the operation of the cutter bar.

The frame of the original model, which consisted of metal tubes and angles, has been replaced with a frame of flat material of cantilever construction, which is said to be more sturdy and less subject to vibration. Formerly the handle bars were welded directly to the frame, but in the improved model, as a means of further reducing vibration, the handle bars are trunnioned at the axis of the wheel and are provided with guiding and carrying support by two spring yokes, one fastened to each bar and attached to the frame.

The transmission shaft and bracket of the scythe have



The Johnson Motor Scythe in Operation

been redesigned to provide a means of adjusting the drive belt, and the pitman shaft has been equipped with a vibration dampener. The pitman connecting rod is of somewhat heavier construction than formerly and is made of drop-forged heat-treated steel. The cutter bar head is of the same material while the clevis pins are made of hardened, ground steel.

The gasoline tank is now constructed of ⅛-in. sheet steel and is welded directly to the main frame instead of being supported above it by means of two vertical members as was formerly the case. The tank has also been provided with a drain plug. The scythe has been equipped with a ½-hp. 2-cycle "utilimotor" which has been manufactured by the Johnson Motor Company for some time. A convenient feature of the motor is the fact that it may be started by a pull on the hand starting lever.

New Types of Spring Washers for Use in a New Field

TWO new spring washers of the double-convolution type are announced by the National Lock Washer Company, Newark, N. J. These washers are known respectively as the Ankor Hipower and the Thackeray, and are intended primarily for use with anchor screw spikes.

With the increasing use of screw spikes to fasten the tie plate to the tie independent of the rail and thus

Thackeray Spring Washer — Ankor Hipower Spring Washer

eliminate the movement between the two under traffic, it is necessary to provide some means of contact between the underside of the head of the screw spike and the tie plate, as the latter settles and becomes embedded in the tie. This separation is often increased by the tendency of the spike to back out.

These two washers have been developed to restrain this tendency to turn back, as well as to provide sufficient pressure, through a wide range of reactions, to eliminate the movement between the tie plate and the tie when the traffic loads are applied. It is said that tests have proved that, while they provide ample compensation, they do not exert sufficient pressure to strip the screw spike from the wood. They were developed as a result of experiments which indicated that a special design of washer was required to meet these demands.

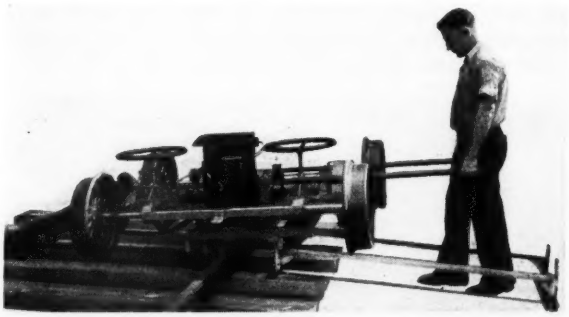
More than two million of these washers are in use at present, and after more than a year's trial under actual service conditions, it is said that they have proved to be entirely satisfactory in eliminating that form of mechanical wear on ties, which results from rolling shear, the impact of passing loads and the rasping effect of the movement of the tie plate on the tie.

Double-convolution spring washers, exactly like the Ankor Hipower spring washer, except that they are heavier in section, are also announced for use on rail joints. This washer, known as the Double Hipower spring washer, is a high-pressure spring washer having a wide range of reactions in the high-pressure zone.

Derailing Apparatus for Track Grinders

THE Railway Track-Work Company, Philadelphia, Pa., has equipped its railway track grinders with apparatus for assuring their rapid and efficient derailment in case it becomes necessary to clear the track quickly. The grinders thus equipped are the Models P-2, P-3 and P-4. The first two were described in the September, 1930, issue of *Railway Engineering and Maintenance*.

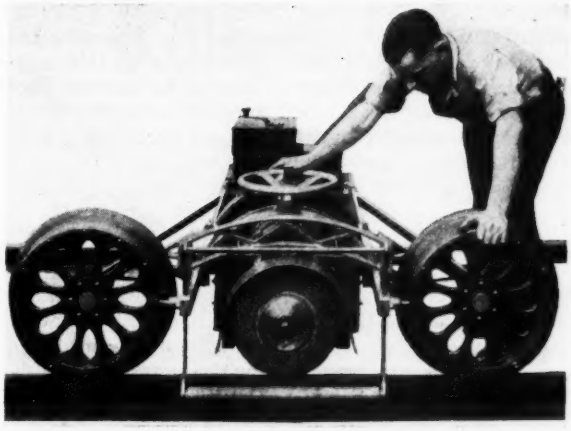
Models P-2 and P-4 are removed from the track by essentially similar methods and apparatus. The apparatus



Removing Model P-2 From the Track

consists of two specially-constructed steel derail frames one of which is placed on the ties between the rails, while the other is laid on the ground outside the rails in a position at right angles to the center line of the track and with one end resting on the ties near the rail. The top members of each frame consist of two parallel steel angles on which the grinder is supported during the derailing operation. These members are approximately at the height of the top of the rails.

When it is necessary to remove the grinder from the track, it is placed over the frame between the rails, and, by means of a conveniently-placed hand crank, two jack rollers underneath the machine are lowered until they bear on the frame with sufficient force to raise the grinder clear of the rails. By means of two extension handles, the operator, who is stationed on the side of the



A Side View of Model P-3 Showing the Roller by Which the Grinder is Derailed

track to which the machine is to be removed, raises the near end of the machine and pulls it toward him on the far roller until the nearest roller bears on the outside derailing frame. The other roller is lifted across the rail by pressing down on the extension handles, and the grinder is then removed to the end of the derailing frame to clear the track. Stops at the ends of the angles prevent the grinder from rolling onto the ground.

The removal of Model P-3 from the track is more simple and requires no additional equipment. This grinder is fitted with a pair of handles at the single wheel and a steel bracket carrying a roller between the wheels at the other side of the grinder. When it is desired to remove the grinder from the track, the roller is lowered until it touches the ties outside of the rails by releasing two adjustable locking pins which fit into a series of holes in two vertical members at the ends of the roller. The operator then lifts the other end of the machine by means of the handles and pushes the grinder off the track on the roller.

Reflex Switch Lamps Require No Oil

A NEW type of switch lamp with colored Reflex reflecting buttons, which contains no provision for internal lighting, has been developed by the Louisville Frog, Switch & Signal Company, Louisville, Ky. This lamp is in service on a number of railways with satisfactory results. It is claimed that the aspect is fully as good and in some cases better than that of the older type of internally lighted lamp, and that the cost of maintenance is negligible. The most important feature claimed for this device is its dependability since it is not affected by wind or weather, there being no inside lamp or filament to be blown or burned out. The illustration shows one of these lamps applied to an ordinary switch stand. The Reflex buttons, which reflect the light from the locomotive headlight, are arranged in a circular form on the four sides of the heavy sheet-metal box which constitutes the body of the lamp. A heavy cast socket is bolted to the under side of the box to slip over the lantern tip at the upper end of the operating shaft of the stand.

The Reflex Switch Lamp

Syntron Develops Scaling Hammer

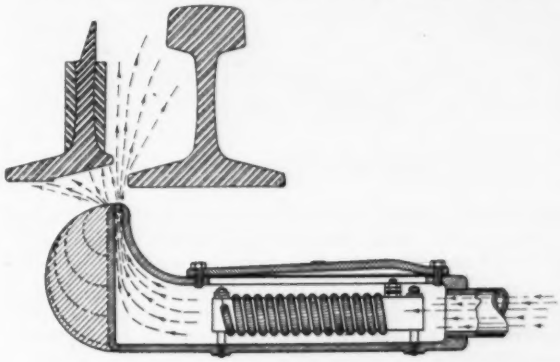
AN ELECTRIC scaling hammer for removing scale from steel bridges and other structures has been recently developed by the Syntron Company, Pittsburgh, Pa. The instrument consists of a cylindrical housing about 3½ in. in diameter which contains a reciprocating piston that is propelled by two magnets receiving alternating current from a dry plate rectifier. The piston, which is the only moving part, strikes the blow directly on the shank of the tool, which fits into a recess at the end of the housing. At the other end of the housing the instrument is fitted with a comfortable grip handle, the overall length, exclusive of the tool, being 12 in. The net weight of the hammer is 10 lb. and the shipping weight is 33 lb. This instrument requires alternating current for its operation and where direct current only is available, a small portable rotary converter is used to convert it to alternating current. The hammer strikes 3,600 blows a minute and it is said that it will not freeze up in the winter or burn in the summer.

The Syntron Scaling Hammer

Switch Heater Utilizes Hot Air

A NEW switch heater which utilizes hot air to melt the ice and snow around switches, crossovers and similar track work has been developed and placed on the market by the Louisville Frog, Switch & Signal Co., Louisville, Ky. This heater, which is known as the Hot Shot, may be arranged to be turned on and off by the towerman, and in large terminals where many heaters are used all may be turned on at once. Another advantage claimed for this heater is that it employs no flame and therefore it is not necessary to turn it off to allow trains to pass.

Air for use in the heater is supplied at a low pressure by a motor-driven blower placed in a suitable housing beside the track, and is conducted to the point of use by steel piping buried in the ballast between the ties. A hollow outlet containing an electric heating element is



A Sectional Drawing of the Hot Shot Switch Heater, Showing the Movement of the Hot Air

placed on the end of each pipe at the point to be heated. The heating element is located concentrically within the end of the outlet so that the air from the pipe must pass over it before it can escape through the holes in the upper side of the outlet.

The heating elements are wound with nichrome wire. It is said that no part inside the outlet will be injured by water and that in the event the outlets become filled with water, they will draw about twice as much current as when dry, and will then produce twice as much heat, which, besides melting snow and ice, serves also to evaporate the water in the outlet.

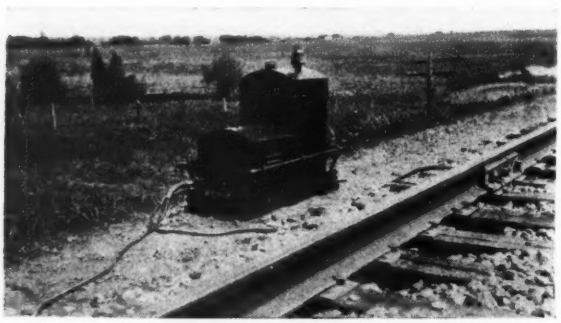
The outlets are made of cast iron and have covers to permit access to the heating units. The covers are sealed by means of asbestos gaskets and brass cap screws. The holes in the tops of the outlets are bushed with brass to prevent them from becoming clogged with rust. Wires for the units are insulated with a fireproof covering and pass through the air pipes, thus eliminating the necessity for an additional conduit.

This heater is generally supplied to operate on 220-volt, 60-cycle alternating current, although it can also be supplied for any other alternating current voltage and frequency or for any direct current voltage. The units may be used in any required number.

New Tie Tamper Power Plant is Lighter in Weight

A PORTABLE electric power plant designed to furnish power for the operation of four of either type of its electric tie tampers has been developed and placed on the market by the Electric Tamper and Equipment Co., Chicago. The new power plant, which is known as the type H-4, weighs 550 lb. and, being lighter in weight than previous models of this company, is designed particularly for use in track gangs of five or six men.

This unit is 40 in. long, 17 in. wide and 31 in. high. It is totally enclosed in removable metal covers that can be locked, and is provided with dolly rollers and lifting bars. Power is furnished by a Le Roi two-cylinder six-horse-



The New Type H-4 Portable Power Plant

power water-cooled gasoline engine equipped with a ball bearing crank shaft and cam-shafts and automatically governed at 1950 r.p.m. The cylinders are 2¾ in. by 3½ in. and the capacity of the radiator is 2 gal., while that of the gasoline tank is 1½ gal. The engine is provided with a conventional automotive type carburetor and a high tension magneto.

The generator, which develops 110-volt, 3-phase, 60-cycle alternating current, is direct connected to the engine with a semi-flexible coupling. It has a capacity of 2 kv.-a. and is equipped with ball bearings. This generator has sufficient capacity to operate either four of this company's universal tie tampers or four of its hammer blow tampers. It may also be used to operate electric tools of the proper current characteristics not exceeding a continuous load service of 20 amp.

A New 70-Ton Ballast Car

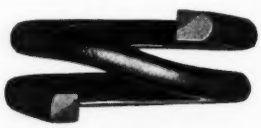
THE Rodger Ballast Car Company, Chicago, has recently added a 70-ton car to its line of Hart Selective ballast cars, which is substantially similar in design and construction to this company's 50-ton car. The dimensions of the 70-ton car are the same as those of the 50-ton unit, except that the length is 41 ft. 4½ in., as

The New 70-Ton Hart Selective Car

compared with 34 ft. 5 in. in the smaller car. Another distinguishing feature of the new car is the fact that it is provided with two sets of discharge doors, while the smaller car has only one set. This feature is said to add to the flexibility of the car in unloading service.

Spring Washers Prolong Life of Railroad Ties

THE vibratory action caused by the wheels passing over rails creates a movement in the tie plates which eventually causes the tie plate to shimmy and imbed itself in the tie. In order to minimize or eliminate this movement, the Reliance Manufacturing Company, Massillon, Ohio, has developed the Hy-Chrome double coil Thackeray spring washer, which has been adopted as standard by several railroads in connection with the application of tie plates held by screw spikes, and is in experimental use on at least a dozen other railroads.



The Double-Coil Thackeray Spring Washer

This appliance, while simple in appearance, has an automatic compensating action through its reactive abilities to function as a holding member. Its efficiency is developed through the special alloy steel from which it is made, combined with the exacting heat treatment methods used in its production and its special design. Its acceptance by the railroad engineers interested in overcoming this construction problem was preceded by considerable laboratory and field experimental work.

Railway Appliances Exhibit

Display of maintenance devices at the Coliseum of great interest during "Engineering Week" in Chicago

ONE hundred and sixty-five manufacturers of equipment and materials used in the construction and maintenance of railway tracks, bridges, buildings and water stations, will participate in the exhibition of the National Railway Appliances Association, to be held at the Coliseum in Chicago, on March 9-12 inclusive. This will be the twenty-third consecutive year that this exhibit has been held during the month of March at the same place, simultaneously with the convention of the American Railway Engineering Association.

As in past years, all exhibit space has been taken up, and owing to the fact that a large proportion of the exhibitors have participated in the show for many years and have occupied practically the same booths each year and since many of those who will visit the exhibit have done so not once but many times, most visitors know where to find the booths of many of the companies that are represented. However, for the benefit of those who are not so familiar with the exhibit and to present a complete account of it, we give below a complete list of the firms participating, the number following each name providing the key to the location in the accompanying floor plan. The exhibit will be opened on Monday morning, March 9, and will close on Thursday afternoon. It will be closed on Monday and Wednesday at 6:00 p. m., on Tuesday it will be open until 10:00 p. m., and on Thursday the exhibition will be ended at 3:00 p. m.

Exhibiting Members

Achuff Railway Supply Company, St. Louis, Mo.....135
Adams & Westlake Company, Chicago.....77-78-96-97
Adams Motor & Manufacturing Company, Chicago....218-218½
Air Reduction Sales Company, New York.....167-167½
American Cable Company, Inc., New York..... 82
American Car & Foundry Company, Chicago.....261
American Chain Company, Bridgeport, Conn..... 81
American Fork & Hoe Company, Cleveland, Ohio.....189
American Hoist & Derrick Company, St. Paul, Minn.....88½
American Railway Hydrant & Valve Company, Stapleton, S. I., N. Y.....159
American Sika Corporation, Chicago.....186
American Steel & Wire Company, Chicago.....265-278
American Tar Products Company, Pittsburgh, Pa.....236-237
Armco Culvert Manufacturers Assn., Middletown, Ohio...99-100

Baldwin-Southwark Corp., Southwark Foundry & Machine Co. Div., Philadelphia, Pa.....219-219½
Barber Asphalt Company, Philadelphia, Pa.....163
Barrett Company, New York..... 85
Bethlehem Steel Company, Inc., Bethlehem, Pa.....69½-70-70½ 71-71½-72
Binks Manufacturing Company, Chicago.....152-153
Bucyrus-Erie Company, South Milwaukee, Wis..... 27
Buda Company, Harvey, Ill.....43-44-45-46 62-63-64-65

Carey Company, The Philip, Cincinnati, Ohio.....166¾
Carnegie Steel Company, Pittsburgh, Pa.....268-275
Caterpillar Tractor Company, Peoria, Ill.....256-257
Central Ironite Waterproofing Company, Chicago.....9¾
Chicago Pneumatic Tool Company, New York..... .....192-192½-193-194-195
Chipman Chemical Engineering Company, Bound Brook, N. J..... 57
Cleveland Frog & Crossing Company, Cleveland, Ohio....90-90½
Cleveland Railway Supply Company, Cleveland, Ohio..... 1
Copperweld Steel Company, Glassport, Pa.....190-191

Creepcheck Company, Inc., Hoboken, N. J..... 87
Crerar, Adams & Co., Chicago..... 28
Cullen-Friestedt Company, Chicago.....116-117
Curtin-Howe Corporation, New York.....151
Cyclone Fence Company, Waukegan, Ill.....264

Dearborn Chemical Company, Chicago.....251-252
Detroit Graphite Company, Detroit.....58-59
DeVilbiss Company, Toledo, Ohio.....288-289
Dickinson, Paul, Inc., Chicago..... 98
Duff-Norton Manufacturing Company, Pittsburgh, Pa.....35-36

Edison Storage Battery Company, Orange, N. J..... 20
Edison, Thos. A., Inc., Primary Battery Div., Bloomfield, N. J.....18-19
Electric Railweld Sales Corporation, Chicago.....222-223-224
Electric Service Supplies Company, Chicago.....287
Electric Storage Battery Company, Philadelphia, Pa.....39-40
Electric Tamper & Equipment Company, Chicago.....203-204
Engineering News-Record, New York.....155
Enterprise Railway Equipment Company, Chicago.....163½-164

Fairbanks Morse & Co., Chicago.....73-74-75-76 92-93-94-95
Fairmont Railway Motors, Inc., Fairmont, Minn..126-127-128-129 145-146-147-148
Fansteel Products Company, Inc., North Chicago, Ill.....238-239
Frog Switch & Manufacturing Company, Carlisle, Pa.....51½-52

General Cable Corporation, Rome, N. Y.....240-241
General Electric Company, Schenectady, N. Y....270-271-272-273
General Railway Signal Company, Rochester, N. Y....47-48-49-50
Griswold Safety Signal Company, Minneapolis, Minn.....184

Harnischfeger Sales Corporation, Milwaukee, Wis..... 4
Hastings Signal & Equipment Company, Boston, Mass.....107½
Hayes Track Appliance Company, Richmond, Ind.....140-141
Headley Emulsified Products Company, Philadelphia, Pa.....157-157½-158
Hopkins Company, Chicago.....239

Illinois Steel Company, Chicago.....269-274
Independent Pneumatic Tool Company, Chicago.....220-221
Industrial Brownhoist Corporation, Cleveland, Ohio.....181
Ingersoll-Rand Company, New York.....206-207-208-209
Inland Steel Company, Red Top Steel Post Dept., Chicago 246

Jewell Electrical Instrument Company, Chicago.....122
Johns-Manville Corporation, New York.....174-175-176-177
Johnson Motor Company, Waukegan, Ill.....225
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.....247-248
Jordan Company, O. F., East Chicago, Ind.....60-61
Joyce-Cridland Company, Dayton, Ohio.....228-229-230

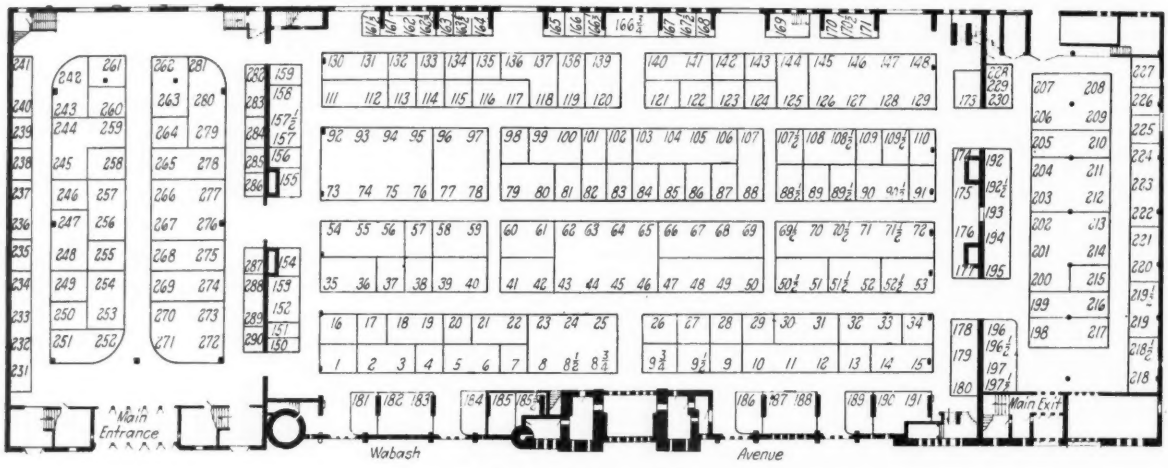
Kalamazoo Railway Supply Company, Kalamazoo, Mich. 8-8½-8¾-23-24-25
Kearney Corporation, James R., St. Louis, Mo.....150
Kerite Insulated Wire & Cable Company, Inc., New York..88-107
Keystone Grinder & Manufacturing Co., Pittsburgh, Pa.....115
Koppel Industrial Car & Equipment Company, Koppel, Pa....285

Layne & Bowler, Inc., Memphis, Tenn.....89½
Lead Clad Steel Corporation, Columbus, Ohio.....282-283
Le Carbone Company, Hoboken, N. J.....41-42
Lehon Company, Chicago..... 91
Locomotive Finished Material Company, Atchison, Kan...125-144
Long Company, Chas. R., Jr., Louisville, Ky.....102
Lorain Steel Company, Johnstown, Pa.....266-267
Louisville Frog, Switch & Signal Company, Louisville, Ky.....262-263
Lufkin Rule Company, Saginaw, Mich.....121
Lundie Engineering Corp., New York..... 89

MacRae's Blue Book Company, Chicago.....290
Magnetic Signal Company, Los Angeles, Cal.....109
Maintenance Equipment Company, Chicago.....118-136-137
Massey Concrete Products Corporation, Chicago.....54-55-56
Mechanical Manufacturing Company, Chicago.....258
Metal & Thermit Corporation, New York.....198-217
Metalweld, Inc., Philadelphia, Pa.....143
Morden Frog & Crossing Works, Chicago.....50½-51
Morrison Railway Supply Company, Buffalo, N. Y..165-166-166½
Murdock Manufacturing & Supply Company, Cincinnati, Ohio.....134

National Boiler Washing Company of Illinois, Chicago..... 13
National Carbide Sales Corporation, New York.....168
National Carbon Company, Inc., New York..... 9
National Lead Company, New York.....187-188
National Lock Washer Company, Newark, N. J.....114
Robertson Company, H. H., Pittsburgh, Pa.....5-6
Roller-Smith Company, New York..... 7

Schultz Bros., Jonesboro, Ark.....169
Scientific Production Corporation, New York..... 37
Sellers Manufacturing Company, Chicago.....123
Signal Accessories Corporation, Utica, N. Y.....113
Sivyer Steel Casting Company, Milwaukee, Wis.....235
Skelton Shovel Company, St. Louis, Mo..... 9½
Smith, A. O. Corporation, Milwaukee, Wis.....249
Snap-On Tools, Inc., Chicago.....142
Sperry Products, Inc., Brooklyn, N. Y.....250
Standard Oil Company of Indiana, Chicago.....2-3
Stoller's Continuous Crossing, Paulding, Ohio.....133
Sullivan Machinery Company, Chicago.....108-108½
Syntron Company, Pittsburgh, Pa.....199-216



Floor Plan of the Exhibit at the Coliseum

National Vulcanized Fibre Company, Wilmington, Del.....124
Nichols & Bro., Geo. P., Chicago.....173
Nordberg Manufacturing Company, Milwaukee, Wis..200-201-202 213-214
Northwest Engineering Company, Chicago.....244-245-259
Northwestern Motor Company, Eau Claire, Wis.....196-196½-197-197½

Ohio Brass Company, Mansfield, Ohio.....253-254
Okonite-Callender Cable Company, Passaic, N. J..... 17
Okonite Company, Passaic, N. J..... 16
Oxweld Railroad Service Company, Chicago.....10-11-12

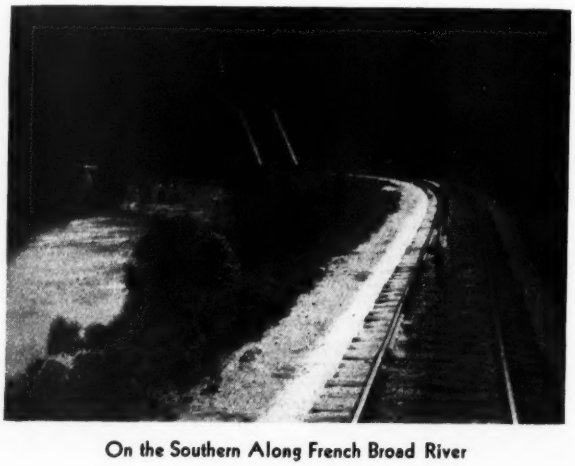
P. & M. Company, Chicago.....119-138
Page Steel & Wire Company, Bridgeport, Conn..... 83
Pettibone Mulliken Company, Chicago.....279-280-281
Pocket List of Railroad Officials, New York..... 26
Pomona Pump Company, Pomona, Cal.....284
Positive Rail Anchor Company, Chicago.....178-179-180
Prendergast Company, Marion, Ohio.....242-243

Q. & C. Company, New York.....120-139

Racine Tool & Machine Company, Racine, Wis.....227
Racor Pacific Frog & Switch Company, Los Angeles, Cal...109½
Rail Joint Company, Chicago.....79-80
Railroad Accessories Corporation, New York.....14-15
Railroad Supply Company, Chicago.....103-104-105-106
Railway Maintenance Corporation, Pittsburgh, Pa.....260
Railway Engineering and Maintenance, Chicago..... 84
Railway Purchases & Stores, Chicago.....154
Railway Track-Work Company, Philadelphia, Pa.....205-210
Ramapo-Ajax Corporation, New York.....110
Rawls Manufacturing Company, Streator, Ill.....226
Reade Manufacturing Company, Jersey City, N. J.....255
Reliance Manufacturing Company, Massillon, Ohio..... 29
Republic Steel Corporation, Youngstown, Ohio.....130-131
Richards-Wilcox Manufacturing Company, Aurora, Ill.....170-170½-171
Roberts Company, The Geo. J., Dayton, Ohio.....161-162-162½
Roberts & Schaefer Company, Chicago..... 34
Templeton, Kenly & Co., Ltd., Chicago.....32-33
Toncan Culvert Manufacturers' Assn., Massillon, Ohio.....132
Transportation Publishing Company, Inc., Los Angeles, Cal.....286

United States Graphite Company, Saginaw, Mich.....161½
U. S. Wind Engine & Pump Company, Batavia, Ill.....111-112
Union Switch & Signal Company, Swissvale, Pa.....66-67-68-69

Waterbury Battery Company, Waterbury, Conn..... 38
Western Wheeled Scraper Company, Aurora, Ill..... 86
Westinghouse Electric & Manufacturing Company, E. Pittsburgh, Pa.....21-22
Weston Electrical Instrument Corporation, Newark, N. J.....156
Wharton & Co., Wm. Jr., Easton, Pa.....52½-53
Woodings Forge & Tool Company, Verona, Pa.....30-31
Woolery Machine Company, Minneapolis, Minn...231-232-233-234
Wyoming Shovel Works, Wyoming, Pa.....101



On the Southern Along French Broad River

WHAT'S THE ANSWER?

Have you a question you would like to have someone answer? Have you an answer to any of the questions listed here?

To Be Answered in the May Issue

1. *What are the best method and equipment for loading rail along main tracks? How many men should be assigned to handle the rail that is being loaded and how should they be placed?*
2. *What are the most effective and economical methods of removing mass concrete? Also thin heavily reinforced sections? What are reasonable costs for the different types of structures?*
3. *When renewing ties without giving the track a general raise, what methods should be employed to minimize the disturbance to line and surface?*
4. *What are the relative advantages and disadvantages of calking lead joints in cast iron pipe with an air hammer and doing this work by hand? What air pressure should be used with the pneumatic tool?*
5. *What effect, if any, does poor spiking or the use of worn spikes have on track conditions? What precautions should be observed in spiking to obtain best results?*
6. *What advantages, if any, are there in the use of building paper or insulating board in the exterior walls of railway buildings? What are the relative advantages and disadvantages of the two materials?*
7. *To what extent should the roadbed be maintained to standard dimensions? When should the shoulders be restored to full height and width and by whom?*
8. *What permanent assignment, if any, of power tools to bridge gangs engaged in timber trestle maintenance, can be justified on the grounds of increased economy and larger output per man-hour?*

Gaging New Rail

What precautions should be observed when gaging new rail? Why ?

Keep the Bolts Tight In Advance

By J. MORGAN

Supervisor, Central of Georgia, Leeds, Ala.

Special care should be taken to insure even and level adzing of the ties to give a full level bearing for the tie plates and rail; otherwise the gage will become irregular after even a small amount of traffic has passed over the rail, owing to unequal and uneven settlement. The joints should always be tightly bolted and there should be at least 40 ft. of free rail ahead of the gage spikers. This practice will eliminate any strain in the rail and avoid the troublesome kinking that occurs so frequently in forcing the rail in or out to bring it to true gage.

Gage Should Always Be Exact

By W. H. SPARKS

General Inspector of Track, Chesapeake & Ohio, Russel, Ky.

Every operation in connection with the laying of rail should be given close attention, but, except for matters relating to safety, I consider correct gaging to be among the most important. My observation is that many trackmen do not sufficiently realize its importance. The first precaution should be that of insuring that all spike holes in ties are properly plugged with creosoted plugs, since gage cannot be held true with spikes driven into unfilled holes.

Proper adzing of the ties to insure an even, level bearing of the rail or tie plates is equally important, otherwise the gage cannot be maintained, besides which the contact surface of the rail head will wear unevenly. Every trackman knows from experience the ill effects of an uneven bearing for the rail.

Perhaps the most important item in securing initially true gage is to have the joints tightly bolted well in advance of the gage spiking. It is impossible to secure good gage unless the bolts are kept in reasonably high tension during the gaging. Only experienced men who are known to be good spikers and careful gagers should be selected to gage new rail.

Second-hand spikes should never be used in gaging new rail. Plenty of places are available in other tracks for which usable second-hand spikes are adapted, so that there is no loss in the use of new spikes for new rail. It is the universal experience that where an attempt is made to reuse the old spikes, neither the gage spikers nor the following gangs which complete the spiking can spare the time to distinguish between usable spikes and those that are throat cut. Thus, an inferior job is sure to result and the rail cannot be held to true gage later.

Gages Should Be Tested

By V. H. SHORE

Yard Foreman, Atchison, Topeka & Santa Fe, Dodge City, Kan.

If good gage is to be maintained, it is essential that the rail be put to true gage at the time it is laid. To insure that this is done, the gages that are to be used should be tested with a master gage before the work starts, and periodically thereafter as it progresses.

Care should be used in adzing to insure an even bearing for the tie plates. To get the best service from the rail, the wheel treads should fully cover the top of the

head, but this can be accomplished only by a slight inward canting of the rail. If canted tie plates are not in use, the ties should be adzed to produce this canting. If ribbed bottom tie plates are used, one or more trains should be run over the track at low speed before full spiking, to seat the plates. Where traffic is diverted to facilitate the rail laying, this is not practicable, but the first trains over such track should be required to run slowly, since the tie plates will then settle vertically to a permanent bearing and the gage will be unaffected. If initial high speed is permitted, the plates seldom settle vertically and the resulting gage will be somewhat irregular, but generally wide.

Gages Should Be Known To Be Correct

By H. BECKER

Section Foreman, St. Louis-San Francisco, Rush Tower, Mo.

Since exact gage is required if best results in life and service are to be obtained from the rail, all gages used in the process of laying should be known to be accurate and the rail itself should be spiked to correct gage at all points. The adzing should be done in such a manner that the wheel treads have contact over the full width of the rail head; otherwise it is extremely difficult to maintain the gage, particularly on curves. Bolts should be well tightened in advance of the gaging. Certain types of patented joints tend to produce wide gage at the joints as a result of later tightening, if sufficient tension is not obtained in the bolts ahead of the gaging.

Under Water Concrete

When necessary to deposit concrete under water, what methods can be employed? What precautions should be observed ?

Special Equipment is Necessary

By E. C. NEVILLE

Bridge and Building Master, Canadian National, Toronto, Ont.

Special equipment is required for placing concrete under water, which will minimize the disturbance of the material and prevent the washing out of the cement. Various types of buckets have been used for this purpose, the most satisfactory being the drop-bottom type from which the concrete is discharged after it comes to rest on the surface upon which the concrete is to be deposited. The concrete settles into place with a gradual slump and the next load is deposited immediately adjacent to the first, the bucket in each case being withdrawn slowly. These buckets should have tight fitting covers to keep the water away from the concrete while it is being lowered.

Another method requires a tremie or tube of sufficient diameter to insure easy passage of the concrete and prevent clogging. The placing of concrete with a tremie requires close supervision, since the tube must be kept full of concrete and raised and moved carefully to insure its proper placing. The tremie is better adapted for use in shallow water, while the drop-bottom bucket gives better results in deeper water.

In foundation work, it is often possible to place a layer of concrete two or three feet thick over the whole surface and allow it to set. If the flow of water is from the bottom, this will often seal it off, so that the coffer dam can be unwatered and the remainder of the concrete placed in the open air.

Wherever concrete is placed under water, regardless of the method employed, every precaution should be taken to avoid disturbing it until it has hardened. It should also be placed as evenly as possible, since it is important to avoid sloping surfaces in the concrete.

Water Should Not Be Allowed to Flow

By ROBERT J. FITZ SIMMONS

Section Foreman, New York Central, McKeever, N. Y.

An essential precaution is that water should not be allowed to flow in the coffer dam while concrete is being deposited. If it is possible to avoid it, however, do not deposit concrete under water, but seal the coffer dam and place the concrete in the open air. If this must be done, the forms should also be water tight to eliminate current and the concrete should be mixed as dry as consistent with the necessary plasticity. Means should be provided to lower the concrete to the surface upon which it is to be deposited without washing any of the cement out. The concrete should never be "poured" through the water, since this will wash all or nearly all of the cement out of it.

Avoid Latiance Under All Conditions

By O. T. LEAVENWORTH

Railways Bureau, Portland Cement Association, Chicago

The depositing of concrete under water is a hazardous operation and should never be employed where it can be avoided. Where it must be done, the mixture should be rich, containing not less than seven sacks of cement to the cubic yard, and five gallons of water to the bag should be used. Every precaution should be taken to insure against interruption and the work should be carried on with sufficient rapidity to prevent the formation of layers. An emergency plant should be held available for instant use in case the regular equipment breaks down. The method followed should be such as to minimize the formation of laitance and avoid the flow of water in the coffer dam or forms until the concrete has hardened.

It is especially important that the aggregates be free from loam or other material which may cause laitance. Washed aggregates are preferable. Coarse aggregate of a smaller size than that used in open-air concrete will give best results. Experienced supervision is of the greatest importance. Many under-water structures have failed because this essential requirement was not recognized.

Extreme care should be exercised to disturb the new concrete in place, or that which is being deposited, as little as possible, to avoid the formation of laitance. If an interruption occurs, and when a section is completed, the laitance should be entirely removed before work is resumed.

Two methods are in common use: (1) the tremie and (2) the drop-bottom bucket, while a third, known as the bag method, is used sometimes. The tremie should be water tight and of sufficient diameter to permit a free flow of the concrete. It should be kept filled at all times until the completion of the work. The concrete should be discharged in such a manner as to maintain, as nearly as possible, an even flow and avoid dropping the concrete through water.

The drop-bottom bucket should be of a type that cannot be dumped until it rests on the surface upon which the concrete is to be deposited. The bottom doors, when

tripped, should open freely downward and outward. The top of the bucket should be open, and it should be completely filled and lowered slowly to avoid backwash. After discharge, it should be withdrawn slowly until free of the concrete.

In the third method, bags of jute or other coarse cloth are filled about two-thirds full with concrete and laid carefully in a header and stretcher system, so that the whole mass is interlocked. This method is not common but has been found effective under certain conditions.

Anchoring Switch Points

What are the relative advantages and disadvantages of bolting switch points to the running and stock rails through filler blocks at the heel of the points, and of using recessed heel plates which leave the points and these rails independent of each other ?

Uses Floating Type of Heel Block

By C. W. BREED
Engineer of Standards, Chicago, Burlington & Quincy, Chicago

For more than 40 years the one-bolt floating type of heel block has been standard on the Burlington. The particular advantage of this construction is that, if the main-track rails creep, neither they nor the switch points are affected by the anchorage at the heel.

When 90-lb. rail first came into use on this road, about 1909, we applied a four-hole heel block to our 90-lb. switches, which had bolts extending through both the running rail and the switch point. This design was quite similar to the heel blocks now in use on many other roads. It was our experience that, in crossovers, the creeping of the rail in opposite directions in the two tracks tended to crowd the switch points toward each other, thus kinking the track at the heel of the switch. Where the switches were interlocked, it was also found that the points tended to bind the lock rods and other fittings. Following this experience, we returned to the floating block, and have found it satisfactory under all conditions.

At present, the track is anchored more securely than it was in 1909, but we are of the opinion that the same difficulties might be encountered if four-hole blocks were again used, since rail anchors do not always do all that is expected of them. An added advantage of the floating block is that two standard splice bars can be used between the switch point and the adjoining rail. Furthermore, the one-hole block costs only about 35 per cent as much as the four-hole type.

Practices Vary in Different Areas

By G. J. SLIBECK
Chief Engineer, Pettibone Mulliken Company, Chicago

Practice with respect to the construction at the heel of the switch varies widely in different sections of the country. Recessed heel plates are used quite generally by the eastern roads, while those in the west usually prefer the heel block. As an observer who must keep in close touch with the practices of the different roads and the problems they are meeting constantly, I am of the opinion that both methods are good, if used under proper conditions.

A railway that standardizes on a heel spread of 5½ or 6 in. cannot very well use recessed plates, for the reason that insufficient clearance is provided for the planing of the shoulders in the plates and for the angle bars that are a part of this construction. An increase in the heel spread of sufficient amount to permit the use of plates, would change many of the remaining features of the design of their switches.

Heel blocks have the distinct advantage of keeping the heel of the points to the same surface as the main rails, and where they are used the battering of the heels is minimized. But to obtain this advantage, the heel block bolts must be kept tight. Because of the longer side planing on points designed for use with heel blocks, a tighter and better fit, as well as better support, are obtained against the main rail. In the lighter sections, 90-lb. and less, this is a definite advantage. Heel blocks cost less than planed-out heel plates and turnout plates, while the same degree of maintenance is not necessary to keep the ties in position. Against these advantages, however, the most serious objection is that, if the rail creeps, it takes the heel block along with it, since they are bolted together, and this may buckle the points.

Creepage does not affect the points where recessed plates are used, an important advantage in main line switches. They also permit the use of a straight rail for the point rail. In heel-block installations, the point must be given a vertical bend to accommodate the riser plates, beyond which it must be brought back to the level of the main rail at the heel. Standard angle bars and track bolts can be used with the heel plates.

Based on long observation and experience, my opinion is that recessed plates should be used on main line switches and heel blocks in yard turnouts. Both methods have their advantages and disadvantages, but neither fully solves the problem of maintaining the heel spread. The ideal design of such a separator would be one in which a projection is cast or forged to the joint fastening, be it angle bar or strap, to prevent movement of the heel of the point and the main rail toward each other. It would then be necessary to use such a device with shouldered plates to prevent movement in the opposite direction.

Of late, some roads are using blocks which are provided with recesses for the heads of the bolts, which, therefore, do not extend through the main rail. This is not an ideal design, however, since this type of block is easily broken if dirt is allowed to accumulate under it and raise it high enough for the wheel flanges to hit it. To minimize such breakage, cast steel blocks must be used, thus increasing the cost.

Does Not Favor Recessed Plates

By V. H. SHORE
Yard Foreman, Atchison, Topeka & Santa Fe, Dodge City, Kan.

There is no advantage of which I am aware in the use of recessed heel plates which leave the switch and main rails independent of each other. On the other hand, I see a definite advantage in bolting these rails together in both main-track and yard switches. If left independent of each other, and the main track rails run, the switch point may be shifted with respect to the bend in the stock rail, thus creating a serious hazard. This condition affects the guard rails as well, and causes much extra work of an unproductive nature.

It is impracticable to anchor track so as to eliminate creeping entirely, although it can be minimized to such an extent as to reduce maintenance troubles materially. Where switch points are bolted to the main rails through filler blocks and the rail is anchored properly, whatever movement does occur is the same in the point as in the

main rails, so that all parts maintain their relative positions. Where the rails are independent of each other, if the main rail runs, the guard rail is moved until the clamps press against the ties. Since these ties are spiked through the frog plates, something must give and, as a rule, the track buckles.

Heel Blocks Should Be Bolted to Main Rail

By A. B. TRUMAN
Division Engineer, Atchison, Topeka & Santa Fe, Las Vegas, N. M.

Heel blocks that are bolted to the switch point only have the advantage that the heel of the point is not kinked out of line if the rail expands or creeps. A serious objection to this type is, however, that there is considerable hazard in connection with its use, because, if it is struck by dragging equipment, it may be forced forward between the point and the stock rail far enough to open the point. In such an event, derailment may occur to a train that is making a facing movement. On high-speed tracks, heel blocks should always be secured by bolts which extend through the main rails.

Heel Blocks Are More Satisfactory

By J. MORGAN
Supervisor, Central of Georgia, Leeds, Ala.

I have had wide experience with both types of construction, and in my opinion the heel blocks give far more satisfactory service. There are some advantages in using bolts that extend through the main rails, since this gives extreme rigidity to the assembly and minimizes movement of the heel under traffic. Against this is the objection that any tendency on the part of the running rails to creep will result in distortion of the bolts and, if of sufficient magnitude, it will shear them.

We have overcome this objection by the use of filler blocks with recesses for countersinking the heads of the bolts, which now extend only through the point and turnout rails, leaving them independent of the main rails. It is our experience that we get as satisfactory results from the blocks acting as separators, while this design has the advantage of making the turnout rails independent of the rails in the main track.

Heel Blocks Give Greater Rigidity

By L. L. ADAMS
Roadmaster, Louisville & Nashville, Louisville, Ky.

Solid heel blocks, fastened with bolts which extend through the main and stock rails, give a much more rigid construction than is possible with any device that leaves the points independent of the main rail. Such blocks prevent the opening of the point while wheels are passing over the heel, a condition that frequently occurs if the maintenance of the heel of the point is not up to standard. In fact, because of this rigidity, the maintenance efforts necessary to keep the heel in good condition are reduced to a minimum.

This construction also minimizes the damage resulting from derailments, since the bolts are protected and both the running and switch rails act together to resist the tendency of either to overturn. Bolts do not get loose as easily and, if they do, they are easier to tighten.

A disadvantage of the solid heel blocks is the cost of installation, owing to the necessity of drilling both main and stock rails. The principal disadvantage, however, is the possibility of the points being moved if the rail creeps. For this reason, there is a question whether they should be used in main tracks where there is a considerable distance between switches. This objection has little or no weight against their use in yards and terminals where the switches are comparatively close together. On my territory there are a large number of switches equipped with solid heel blocks, and I have never experienced any trouble because of running rail with respect either to movement of the points or shearing of the bolts.

Aids in Cases of Derailment

By J. J. HESS
General Roadmaster, Great Northern, Seattle, Wash.

Within the range of my experience I have never known of any disadvantage in the bolting of switch points to the running and stock rails through filler blocks at the heel of the points. On the other hand, this practice has many advantages, the most important of which are:

The installation of a filler block at the heel of the point prevents the widening of the gage, which was very difficult before bolted heel blocks came into use. The full bolting of the main rails and points through a filler block causes them to act as a unit during any movement of the track rails, so that they always maintain the same positions relative to each other. For this reason, the effect of creeping stock rails is minimized.

The greatest advantage, however, as I see it, is the ease with which wheels can be rerailed in case a derailment occurs in the vicinity of the switch. Usually the wheels can be rerailed with little delay and without the use of rerailing frogs. The filler blocks also act as very satisfactory foot guards.

Lump or Hydrated Lime?

From the standpoint of operation, what are the advantages and disadvantages of using lump lime as compared with hydrated lime at water-treating plants ?

Lump Lime Is Economically Advantageous

By Engineer of Water Service

An objection often made to the use of lump lime is that many producers do not burn it properly. We have minimized this objection by buying only from manufacturers who deliver a satisfactory product. Another is the tendency of the lime to slake in storage, air-slaked lime being wholly useless in the treatment of water. This trouble can be practically, but not wholly, eliminated by providing air-tight storage bins, so designed that the lime for current use is always taken from the bottom.

The most serious and most frequently-raised objection to the use of lump lime, particularly in intermittent plants, is the uncertainty as to the amount of active lime (Ca0) that is added to the raw water, since the amount of unburned and air-slaked lime that gets into the slaking tank cannot be determined accurately. This uncertainty can be minimized, however, almost to the point of being negligible, by limiting purchases to those concerns that furnish a satisfactory product and then putting it into air-tight storage.

Hydrated lime is, or should be, a uniform product that does not deteriorate, if properly cared for, within the period of storage usually required at a water station. It comes in sacks that are easily handled and that are practically free from dust. It can be stored with less trouble and less time is required to prepare the solution,

while the accuracy of the treatment is easily maintained. The proper slaking of lump lime is an art, and it requires considerable time and effort to educate pumpers before they become proficient in this part of their work.

While the question apparently limits the discussion to the operating features of the use of these materials, a consideration of their respective values can scarcely ignore the fact that, except at small stations, the cost of the lump lime is only about two-thirds that of the hydrated lime for treating equal quantities of the same water. Where large quantities of water are treated, this difference may amount to an attractive sum. It is explained in part by the difference in price, and also because hydrated lime contains 25 per cent by weight of water. The latter fact makes it necessary to use about 32 per cent more hydrated lime in order to provide the equivalent amount of CaO that is contained in the lump lime. Furthermore, freshly slaked lime, like many other nascent or semi-nascent chemicals, seems to react more vigorously when introduced into the raw water, a decided advantage when treating cold waters.

Both Have Their Uses

By O. T. REES
Chief Chemist, Atchison, Topeka & Santa Fe, Topeka, Kan.

Our experience in supervising and operating about 160 lime-soda ash water-treating plants, with daily capacities ranging from 1,600 gal. to 1,250,000 gal., indicates that under proper conditions, both of these materials are satisfactory and economical.

Hydrated lime costs more, but for water stations of small demand it may be cheaper to use it, owing to the loss of lump lime from air slaking, the time required to make up the chemical solution because of slaking, and other dependent conditions of plant operation which may combine to offset the difference in price.

Costs vary as between manufacturers and different areas, but typical quotations are, $9.40 a ton for lump lime and $11.05 a ton for hydrated lime. According to the A. S. T. M. specifications for lime for water treatment, lump lime must contain 90 per cent of available lime (CaO) and hydrated lime for the same purpose must contain 68.1 per cent. Thus, for each 100 lb. of lump lime, 132 lb. of hydrated lime would be required or, to put it another way, one ton of lump lime is equivalent to 1.32 tons of hydrated lime. At the prices given, there is, therefore, a difference of $5.19 a ton, or 55 per cent, in favor of the lump lime. At a large water station, this would mean a very large difference in the total expense.

Records of two selected stations show that they used 327 and 263 tons, respectively, of lump lime during 1930. At $9.40 a ton, this lime cost $3071.80 and $2460.20. If hydrated lime had been used, 432 tons and 347 tons would have been required, costing $4773.60 and $3834.35, respectively. Thus the use of lump lime saved $1701.80 in the operation of one plant and $1374.15 at the other. In both cases, the saving for a single year was sufficient to pay the cost of the more substantial air-tight bins, suitable for storing the lump lime. These two stations treat only a small part of the total water that is treated by this method on the system on which they are located, so that the total saving effected by the use of lump lime amounts to a large sum annually.

If the amount of water treated at any station is small, the depreciation in the active value of the lime through air slaking may be great. At such stations, better and more uniform treatment may be obtained at less cost by the use of hydrated lime. At other stations of small consumption, it may be more economical to use hydrated lime because of the cost of providing equipment for storing and slaking the lump lime.

Again, where the quality of the raw water changes rapidly, requiring frequent changes in the chemical solutions, the use of hydrated lime is more satisfactory, owing to the greater facility and rapidity with which the lime solution can be changed. It is true that, if the raw water becomes softer, both the lump and hydrated-lime solutions can be diluted. But, if it becomes harder, the change cannot be made so quickly with lump lime, since additional lime must be slaked, while hydrated lime can be added directly to the chemical tank without increasing the volume of the solution.

Caving Foundations

When excavating beneath main tracks in constructing box culverts or abutments, what methods can be employed to prevent caving of the embankment material ?

Method is Controlled by Depth

By L. G. BYRD
Bridge and Building Supervisor, Missouri Pacific, Wayne, Ark.

The method that is best adapted for work of this character is controlled largely by the depth of the excavation and the kind of material that is to be removed. If the embankment is high, it is quite necessary to drive a falsework trestle in order adequately to protect the traffic, the length of the span or spans being determined by the width of the foundation excavation. The sides of the excavation should be completely sheathed and supported by heavy waling courses and struts or coffer dam bracing to prevent caving.

If the soil is soft or weather conditions are unfavorable for such work, it is advisable, in many cases, to drive sheet piling. To depths not exceeding 12 ft., however, with favorable soil and weather conditions, the sheathing is more economical and affords fully as satisfactory results as the sheet piling. Either method allows ample room for the workmen who are engaged in making the excavation.

Several Methods Are Practicable

By Engineer of Bridges

If the excavation is narrow and proportionately shallow, it is often sufficient, even on comparatively busy tracks, to install mud sills and stringers to carry the track and then carefully sheet and brace the trench. Where the traffic is dense or the excavation wider, say 6 ft. or more, no excavation should be undertaken without the protection of a temporary trestle. Under some conditions it may be economical to provide 1:1 or flatter slopes outside the foundation area to eliminate the hazard of caving. This method requires considerably more excavation but eliminates the cost of shoring and sheeting or reduces them to a minimum. At the same time it provides ample room for the use of such equipment as may be adapted for the work. Sometimes a small amount of bulkhead back of the pile bents will permit much steeper slopes without requiring more than a nominal amount of bracing.

Sloping the sides of the excavation is not always desirable or practicable, however. In this event, sheet piling

should be driven to the required depth, independent of the pile trestle bents, to enclose the excavation and give the required clearance. As the excavation proceeds, waling timbers and bracing should be applied the same as in ordinary coffer dam construction.

Depends on Local Conditions

By I. ANDERSON
Division Engineer, Atchison, Topeka & Santa Fe, Argentine, Kan.

Where work of this kind must be done, the amount and character of the traffic, the practicability and effect of speed restrictions, the period of construction, the quality of the embankment and foundation material and the probable amount of water to be met, must all be given consideration in planning the construction methods. On busy tracks, where it is important to eliminate or minimize delays, it may be necessary to go to the expense of providing a temporary trestle over which full speed can be maintained. Sheeting and bracing should always be provided where the trench is deep or the material encountered is unstable.

It is difficult to cover in a general statement all of the possible methods or combinations of methods that may be adapted for this class of work, since so many variable conditions are likely to be met. Frequently we are able to divert traffic over other tracks, thus obtaining the uninterrupted use of one track during the period of construction. Frequently this sort of work is undertaken during seasons of light traffic when diversions or speed restrictions cause little inconvenience or delay.

Early Tie Renewals

What advance preparation can section gangs make in the late winter and early spring that will facilitate the renewal of ties and enable them to complete this part of the season's program early in the summer ?

Preparation Should Start Early

By E. P. SAFFORD
Supervisor of Track, New York Central, Silver Creek, N. Y.

Preparation for efficiency in tie renewals should start at midsummer of the previous year. When estimating the tie requirements for the ensuing year, the foreman should block off and mark the miles in units of about 500 ft., recording the number of ties that are estimated for each block. This permits the unloading of exactly the right number of ties in each block. The ties are thus close to the point of use and can be piled in neat pyramidal piles of 15 each, which gives a good appearance, reduces the fire hazard and minimizes trucking.

Where this practice is permitted, the ties can be placed neatly along the sod line late in the winter, opposite the places where they are to be used, ready for immediate application. Where this general distribution is not permitted, only a short time is required each morning to distribute the ties needed for the day, so that in either case this advance preparation is a marked aid in the early completion of the tie program.

Programming the section work, especially tie renewals, is desirable, since it always accelerates the work. In my opinion, the practice of raising one-half or one-third of the section out of face every year tends to accelerate the tie renewal program, since the ties are more easily installed and the track is always kept in better condition. Furthermore, by concentrating the tie renewals, a triple advantage is obtained for less track is disturbed each year; an increased number of ties can be put in per man-hour; and the work train expense is reduced, since only a fraction of the total mileage must be covered to unload and properly distribute the ties.

Should Distribute Season's Requirements

By V. H. SHORE
Yard Foreman, Atchison, Topeka & Santa Fe, Dodge City, Kan.

About the only advance preparation that will be of real benefit in facilitating the later work of tie renewals, is an exact distribution of the ties that are to be used. The foreman should mark the ties that are to come out in advance of the distribution and an exact count should be made by miles. A slight excess of ties should be distributed, because some ties are always found when the track is disturbed whose condition was not apparent from a surface inspection and that were not included in the estimate. This will run from a few ties on track where spot renewals are made to 25 per cent on track that is to be completely overhauled. In making the distribution, the ties should be placed at right angles to the track, slightly to one side of the defective tie, so as not to obstruct its removal.

Exact Distribution Will Help

By J. J. DESMOND
Division Engineer, Illinois Central, Chicago

There is little advance preparation that is possible in the fall and early winter for the renewal of ties during the ensuing year, except to distribute and pile the ties to the best advantage as they are delivered on the miles upon which they are to be used, locating the temporary storage piles at such points as will minimize the amount of trucking that must be done later. In the late winter and spring, the final details of distribution should be completed, placing every tie approximately at the point where it is to be used. Section foremen can accomplish a great deal by making a close study of their tie conditions, examining the bearing surfaces of the ties in service and arranging where practicable to place new ties next to those which it is thought must be removed next year. If this is done, ties that are marked for removal can often be left for another year without detriment, and the track forces have thus saved a tie and the labor that is incidental to its removal. Foremen will also find it to their advantage to make preparations for organizing the larger force that will be allotted in the spring, using the men in the winter force as the key men around which the expanded gangs can be organized.

Make Every Preparation Possible

By G. STAFFORD
Section Foreman, Canadian National, Rosebud, Alta.

Climatic conditions in this territory reduce the dependable working season to about six months, so that we are compelled to make all of the advance preparation for tie renewals that is practicable. We receive our ties not later than the fall preceding their use, and pile them in pyramidal stacks of 10 each. Immediately after the tie inspector has marked the ties for renewal, which is done as soon as the track is clear of snow, we distribute the ties, spotting them opposite the old ones and placing the line end correctly.

If the ties are not prebored, it is good policy to bore the ties, four holes to the rail, that are to be inserted near bridges and at places subject to chronic heaving, to minimize damage from frequent spiking.

We commonly remove the tie dating nails from ties that are taken out and this can be done in advance. Anti-creepers can be shifted from the marked ties to adjacent ties, thus saving considerable time after renewals begin. When the frost begins to go out, jack holes can be prepared, at least over part of the territory to be covered. In some instances, it has been found practical to remove the ballast at the ends of the defective ties to minimize the later work of renewal. The track should never be cribbed in advance, however. Where the ties are deeply rail cut, a certain amount of adzing in advance will frequently facilitate the later work.

Eliminating of Lost Motion Desirable

By A. G. SAUNDERS

Section Foreman, Chesapeake & Ohio, Marion, Ohio

On roads that deliver the season's tie requirements before renewals are started, every preparation should be made which will eliminate lost motion in the gang when the tie program is under way. The most important of these steps is to have the ties where they are wanted and in such position that they can be handled into the track in a minimum of time and with a minimum of labor. This makes it desirable to mark, preferably on the rail, the location of every tie that is to be renewed, so far as this can be determined by surface inspection. The foreman can do this rapidly enough to keep ahead of the average-size winter gang. The ties should be trucked out late in the winter and placed exactly opposite these markings and at right angles to the track. This practice will permit the gang to give all of its time to tie renewals when this work starts.

Inspecting Bridges

With respect to what details should track foremen be required to inspect the bridges on their sections ?

Required to Observe Numerous Details

By A. N. REECE

Chief Engineer, Kansas City Southern, Kansas City, Mo.

We do not employ regular bridge inspectors, but require division bridge foremen to make frequent inspections. Section foremen are instructed to observe particularly the line and surface of the track on all bridges. They are also required to observe the action of steel bridges under traffic to detect unusual vibration and, where this occurs, to locate, if possible, the loose member that may be the cause of the vibration. They also watch the action of the shoes on the bridge seats and look for loose nuts on pins or bolted connections.

In making inspections of trestles, they are required to know the condition of the piling, or of the posts in framed structures, of the sills, caps, sway and longitudinal bracing, stringers, ties and guard rails, and to look for unusual vibrations under trains.

They must keep drainage ways unobstructed through culverts; watch for cracks or deterioration in masonry, and, where necessary, place riprap to eliminate scour or the weakening of the structure by the action of the water which passes through the opening. When defects are noted in any of these structures, which in the opinion of the section foreman require immediate attention, he reports by wire to the division engineer, giving all the essential data. Section foremen are required to make a daily inspection of structures known to contain weak points, and a careful inspection of other structures at intervals of once a month.

Foremen Should Have Some Responsibility

By E. C. NEVILLE

Bridge and Building Master, Canadian National, Toronto, Ont.

In addition to the track across the bridges, which section foremen should inspect the same as tracks elsewhere, they should be required to know that ties are properly spaced, that hook bolts and guard timber bolts are in place, that there is no settlement of the bridge or approaches, that proper line is being maintained, that all water barrels are in place and filled and that the buckets are in place. They should know that girders are not pressing against back walls, that shoe plates are in proper position, that bridge seats are clean, and that there is no accumulation of drift wood around or near the structure.

Line and Surface Are Most Important

By J. MORGAN

Supervisor, Central of Georgia, Leeds, Ala.

Section foremen should be required to pay particular attention to the line and surface on bridges, since serious defects in these structures are almost invariably reflected in irregular line or surface, or both. On steel bridges they should inspect pins for loose nuts and other connections for loose or working rivets. Wooden structures should be examined periodically by section foremen to detect defects such as crushed caps, sills or stringer ends, and they should notice whether all bearings are in good condition and tight. They should also remove all combustible matter, such as birds' nests, drift or stray paper, which might be ignited by sparks from locomotives.

Should Inspect When Walking Track

By V. H. SHORE

Yard Foreman, Atchison, Topeka & Santa Fe, Dodge City, Kan.

A section foreman should inspect all bridges and culverts on his section every time he makes a personal inspection of his track and should require track walkers to do this periodically. He should know that the line, surface and gage are satisfactory and that all track fastenings are functioning properly; that substructures above the ground or water line are in good condition; and that no combustible material has accumulated around or near timber structures. Without this knowledge, he is not in position to know that his section is safe for the passage of trains. He should report immediately any defect which is beyond his ability to repair and, if necessary, place slow orders and patrol the track until the defect has been repaired.

Should Make a Thorough Inspection

By ROBERT WHITE

Section Foreman, Grand Trunk Western, Drayton Plains, Mich.

Since the track foreman must go over his section regularly in the execution of his other duties, I am of the opinion that he should be required to stop periodically at each of the structures on his territory and examine

them with respect to defects that might affect the safe passage of trains. In addition, he should note and remove all accumulations of drift or other combustible material and see that no fires have been left burning by trespassers or others. He should carefully examine fire barrels and ascertain that they are full—hunters sometimes damage them by shooting into them. He should note and remove logs or trees that are lodged against the structure and which may cause scour. He should insist that all old piles are cut off at the ground line or below low water to eliminate the probability that they will obstruct the passage of drift. If the stream gives trouble from ice, all fences should be kept away from the structure to minimize the danger of ice jams. He should see that all spikes are driven down and that guard-rail timbers are in good condition.

Stoves Vs. Heaters

From the standpoints of maintenance and economy, what are the relative advantages and disadvantages of stoves and hot-water heaters for small stations ?

Finds Hot-Water Heaters Advantageous

By H. G. DALTON
Engineer of Buildings, Chicago, Burlington & Quincy, Chicago

I would include small steam-heating plants in the discussion of this question, since we find they are also adapted for many of the situations for which the small hot-water plant is adapted. We find that these two types possess many advantages over stoves, from the standpoints of improved design and economy. They promote better combustion, thus lowering coal consumption, while they heat the rooms more uniformly. They are more cleanly and, from the standpoint of fire protection, they greatly minimize the fire hazard.

This Question Is Important

By FRANK R. JUDD
Engineer of Buildings, Illinois Central, Chicago

Serious thought should be given to this question since it is an important one. In doing so, several things should be considered, among them the size, location, occupancy and importance of the station. Occupancy is intended to mean the length of time during the day that the building is kept in service, rather than the character of its use. If a building is occupied for only part of the day, it is not advisable to install a hot-water plant, since it probably will not receive proper attention and might be allowed to freeze.

Ordinary stoves do not solve the problem of heating such buildings, because as heating mediums they are unsatisfactory. Among the other disadvantages of stoves, they do not heat the rooms uniformly. A type of stove, known as a circulating heater, is now on the market, which has a jacket with an air space, open at the top and bottom, between the stove proper and the jacket. This arrangement starts a positive circulation as soon as the air inside the jacket becomes heated, which causes a relatively uniform distribution of the heated air throughout the room.

If stoves are used, it is necessary to place one in each room. It is also customary for obvious reasons to remove them during the summer months, and set them up again in the fall. This is an expensive and wasteful practice. Hot water systems have a definite advantage in this respect, since the fire is carried in a single furnace and the heating fixtures are stationary.

In my opinion, hot water systems should be used in small stations which are occupied all or nearly all of the time. Where the building is occupied only part of the time, circulating heaters would seem to be most satisfactory. In some instances, the latter can be arranged to heat more than one room. For the use suggested, they have the advantage that, if the fire should go out, no harm is done.

As a matter of further information, since it extends the possibilities of the small hot-water plants, there is on the market a liquid which the manufacturer claims can be used as a substitute for water as a circulating medium in water heating systems. It is said that this liquid has a freezing point of —35 deg. and a boiling point of 230 deg., and that it is non-corrosive and odorless, making it an ideal product for this purpose.

Heating Plants More Efficient

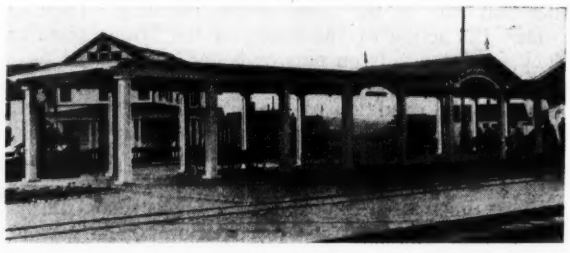
By A. B. TRUMAN
Division Engineer, Atchison, Topeka & Santa Fe, Las Vegas, N. M.

Efficiency in combustion is the outstanding advantage of hot-water heating plants for small stations, as compared with stoves, although they also possess other important advantages. A small plant of this character will heat a small station more efficiently, with respect to both the uniformity of the temperature in the rooms and the continuity of the heat, than is possible with stoves, and will do this on 25 per cent of the fuel that would have been consumed by the stoves. In addition, the station can be kept cleaner and neater with the expenditure of less time and effort on the part of the station employees.

Hot Water Heaters Economize on Fuel

By E. C. NEVILLE
Bridge and Building Master, Canadian National, Toronto, Ont.

At a typical small station which requires from two to four stoves it will generally be found that one small hot-water heating plant will heat the building more comfortably and at the same time reduce the fire hazard. The maintenance of stoves in small stations consists principally of the renewing of the stove pipes, the grates and the fire pots. If a hot-water plant is installed, this maintenance is reduced to the equivalent of one stove, since the repairs to the piping and radiators are practically negligible. There is also a corresponding reduction in the cost of fuel and, sometimes, in the cost of attendance. Fires must be kept going over night in the heater to avoid damage from freezing. But this extra consumption of fuel is more than offset by the greater economy of combustion.



Chicago, Milwaukee, St. Paul & Pacific Station at Three Forks, Mont.

NEWS OF THE MONTH

I. C. C. Gets Appropriation

The independent officers appropriation bill, carrying appropriations amounting to $9,412,473 for the Interstate Commerce Commission for the fiscal year 1932, was passed by the House of Representatives on January 27.

Bus Lines Meet Lower Fares

Twelve motor coach lines operating in the Southwest lowered their passenger fares to two cents a mile at a recent meeting in Kansas City, Mo., in order to meet the two-cent rate of the St. Louis-San Francisco and other roads in that territory. The lines also agreed to a 10 per cent reduction on round-trip tickets.

Employment Shows Further Decline In December

As of the middle of December, the number of employees in the service of the Class I railways of the United States was 1,356,724, a reduction of 37,679 from the middle of November and of 15.47 per cent as compared with December, 1929, according to the Interstate Commerce Commission. This number also represented a decrease of 16.35 per cent as compared with December, 1928.

Three Roads Try One-Cent Fare

Following the announcement of the Southern Pacific that it would establish round trip rates equal to one cent a mile from February 20 to 27, the Western Pacific and the Atchison, Topeka & Santa Fe have made similar reductions during the same period. This rate is effective throughout the entire system of the Western Pacific, while on the Santa Fe it applies from Bakersfield, Cal., to points north.

Circuit Court Decision Limits Authority of I. C. C.

The authority of the Interstate Commerce Commission to compel the construction of new lines by existing railroads was held to be limited to such extensions as are reasonably necessary to reach communities and industries which the carrier has professed to serve or to an undertaking which the road has expressly or impliedly assumed, by a recent decision of the United States circuit court of appeals at Portland, Ore. In this decision the court enjoined the I. C. C. from enforcing its order seeking to require the Oregon-Washington Railroad & Navigation Company to construct a line from Crane, Ore., to Crescent, 185 miles. It is expected that the commission will appeal the decision.

Freight Traffic Statistics

Railroad freight traffic totaled 422,116,659,000 net ton-miles in 1930, a reduction of 70,196,763,000 ton-miles or 14.3 per cent under 1929 and of 11.5 per cent under 1928, according to figures compiled by the Bureau of Railway Economics. Freight traffic handled by the Class I roads in December amounted to 29,025,837,000 net ton-miles, a reduction of 7,020,552,000 net ton-miles, or 19.5 per cent, below that of the same month in 1929.

Would Subject Pipe Line Carriers to Commodities Clause

Legislation to subject oil pipe-line companies to the commodities clause of the interstate commerce act, thereby preventing them from engaging in business other than that of a common carrier, and separating them from the producing, refining and marketing phases of the business is proposed in a bill recently introduced in the House of Representatives by Representative Hoch of Kansas.

I. C. C. Directs Norfolk & Western to pay $15,849,344

The Norfolk & Western is the subject of the first tentative recapture report issued by the Interstate Commerce Commission to one of the larger systems. This report was made public on February 13, and directs the N. & W. to pay to the commission, unless it files a protest by March 25, the sum of $15,849,344, as one-half of its net railway operating income in excess of 6 per cent on its value, as computed by the commission, for the years 1924, 1925 and 1926. In determining the value of the system, an attempt was made to give weight to the cost of reproduction new as was directed by the Supreme Court some time ago, although the affect of this cost was reduced somewhat by averaging it with an estimated original cost, less depreciation. The excess income found by the commission was $2,582,400 for 1924, $10,312,101 for 1925 and $18,804,186 for 1926.

93,616 Sign Petition to Regulate Highway Transportation

A petition asking that legislation be enacted to regulate motor transportation carriers and to require them to pay an adequate amount in rental fees or taxes was signed by 93,616 business and professional men in the territory of the St. Louis-San Francisco, among whom it was circulated by employees of the road. The petition acquired 42,839 signatures in Missouri, 16,558 in Oklahoma, 12,945 in Kansas and 9,508 in Arkansas.

Freight Train Speed Makes Record in 1930

The average speed of freight trains in 1930 was 13.8 miles an hour, an increase of 0.6 mile above the best previous record which was established in 1929, according to the Bureau of Railway Economics. The average daily movement per freight car last year was 28.7 miles, a reduction of 3.6 miles as compared with the same figure for 1929, and the average load per car in 1930 was 26.7 tons, a reduction of 0.2 of a ton as compared with the previous year.

Two-Cent Fare Gains Ground In the Southwest

Passenger fares of two cents a mile went into effect on a considerable portion of the competitive mileage in the Southwest as well as in states farther east on February 1, following the refusal of the Interstate Commerce Commission to suspend tariffs filed by the St. Louis-San Francisco establishing the lower rate throughout its system. A number of roads opposed vigorously the proposal of the Frisco, but when the I. C. C. consented to the reduced fares these roads, in addition to several others, announced that they would also establish the two-cent fare between competitive points. These roads include the Missouri Pacific, the Missouri-Kansas-Texas, the St. Louis Southwestern, the Chicago, Rock Island & Pacific, the Atchison, Topeka & Santa

Fe, the Kansas City Southern and the Illinois Central. The two-cent fare has now been established on a large mileage between points in Central, Western, South and Southwestern states, although the Frisco is as yet the only road to make the fare system wide.

Chicago Fast Freight Service Better Than in 1929

Fast package freight service operated by railroads out of Chicago in 1930 was 95.34 per cent on time as compared with 92.48 per cent in 1929. Of the 664,153 package cars dispatched in 1930, 633,217 reached their destination on time, while of the 718,671 cars shipped in 1929, 667,514 arrived on time. In 1930, 24,134 cars or 3.63 per cent were one day late as compared with 38,592 cars or 5.63 per cent in 1929. Those cars more than one day late in 1930 totaled 6,802 or 1.02 per cent, while 12,565 cars or 1.89 per cent were more than one day late in 1929.

North Western Establishes New System Safety Record

A new system safety record was established by the Chicago & North Western in 1930, when it reduced the number of employees killed to 0.14 per million man-hours and the injuries to employees to 2.56 per million man-hours. Fatalities to employees were 59 per cent lower than in 1929 and injuries to employees were reduced 76 per cent. All classes of fatalities were reduced 22 per cent and all classes of injuries were reduced 58 per cent, as compared with 1929. No passengers were killed during 1930 and injuries to passengers underwent a 27-per cent decrease. Highway crossing accidents decreased 26 per cent as compared with 1929.

Western Pacific Gets All-Rail Entrance to San Francisco

The Western Pacific California, a subsidiary of the Western Pacific, was recently authorized by the Interstate Commerce Commission to construct its proposed line from San Francisco south to Redwood City, Cal., and thence to Niles via a bridge across San Francisco Bay. The completion of this project will not only provide an all-rail entrance into San Francisco for the Western Pacific but also for the Great Northern when that road completes its line south from Oregon to a connection with the former road. The authority to construct the bridge and trackage, however, was given only in the event the Western Pacific California is unable by April 1 to secure from the Southern Pacific trackage rights over its Dumbarton bridge and adjacent trackage on reasonable terms. It is further stipulated that no portion of the proposed line be placed in service until the entire project is completed or covered by trackage rights. The W. P. is also required to grant trackage rights over the new line to any road operating 250 or more miles of line and desiring to obtain an all-rail entrance into San Francisco. The cost of the new line from San Francisco to Redwood City, 22 miles, is estimated at $4,167,786, and from the latter point to Niles, including the bridge, the estimate is $3,829,567. The commission estimates that 11.57 miles of construction could be saved and the cost reduced by $3,605,000 by the use of the Southern Pacific line and bridge.

Fewer Freight Cars and More Locomotives in 1930

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The railroads will continue to be the producers of low cost transportation and the carriers of the materials and finished products of the great bulk of American industry, according to Gen. W. W. Atterbury, president of the Pennsylvania, who expressed this sentiment in a recent address. Gen. Atterbury bases this conclusion on the following factors: (1) The progress that has been made in establishing a basis for the sound co-ordination of other forms of transportation with the railways, which will enable the public to utilize the best and most economical type of transportation; (2) increased efficiency in the operation of railways and the consequent high standard of service and lower operating ratios in the face of lower ton-mile revenues and declining passenger business; (3) progress on the part of the railways in readjusting their methods and practices with a view to recapturing business that has tended to move some other way; and (4) progress in consolidation as represented by the recent promulgation of a four-system plan in the east.

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The Ideal Weed Killer

ATLACIDE
CALCIUM CHLORATE
IN DRY FORM

ATLAS "NP"
CALCIUM CHLORATE
IN LIQUID FORM

VISIT
Booth 57
at the
COLISEUM

BEFORE you buy a weed killer—study its chemical analysis.

The first chemical weed killer, *sodium arsenite,* was poisonous to animals, and limited in effectiveness on certain noxious weeds.

The first non-poisonous weed killer—sodium chlorate, was effective only in *damp* weather, and was inflammable.

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Chipman Chemical Engineering Co. Inc.
BOUND BROOK, N. J.
Chicago, Ill. Palo Alto, Cal. Houston, Tex. Atlanta, Ga. Kansas City, Mo. Winnipeg, Man.

Fe, the Kansas City Southern and the Illinois Central. The two-cent fare has now been established on a large mileage between points in Central, Western, South and Southwestern states, although the Frisco is as yet the only road to make the fare system wide.

Chicago Fast Freight Service Better Than in 1929

Fast package freight service operated by railroads out of Chicago in 1930 was 95.34 per cent on time as compared with 92.48 per cent in 1929. Of the 664,153 package cars dispatched in 1930, 633,217 reached their destination on time, while of the 718,671 cars shipped in 1929, 667,514 arrived on time. In 1930, 24,134 cars or 3.63 per cent were one day late as compared with 38,592 cars or 5.63 per cent in 1929. Those cars more than one day late in 1930 totaled 6,802 or 1.02 per cent, while 12,565 cars or 1.89 per cent were more than one day late in 1929.

North Western Establishes New System Safety Record

A new system safety record was established by the Chicago & North Western in 1930, when it reduced the number of employees killed to 0.14 per million man-hours and the injuries to employees to 2.56 per million man-hours. Fatalities to employees were 59 per cent lower than in 1929 and injuries to employees were reduced 76 per cent. All classes of fatalities were reduced 22 per cent and all classes of injuries were reduced 58 per cent, as compared with 1929. No passengers were killed during 1930 and injuries to passengers underwent a 27-per cent decrease. Highway crossing accidents decreased 26 per cent as compared with 1929.

Western Pacific Gets All-Rail Entrance to San Francisco

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ASSOCIATION NEWS

Wood-Preservers' Association

The members of the Executive committee will meet at the Palmer House, Chicago at 10 a. m., Tuesday, March 10, to complete the organization of the association's activities for the new year.

Roadmasters Association

The members of the Executive committee will meet with the chairmen of the standing committees at the Hotel Stevens, Chicago at 6:30 on Monday evening, March 9. Special attention will be given to the preliminary reports of the chairmen of the various committees.

The proceedings are now in type and it is expected that they will be bound and mailed to the members early in March.

Bridge and Building Association

Those members of the association attending the A. R. E. A. convention and the N. R. A. A. exhibit are invited to lunch together in the dining room of the Davis store on Wednesday noon, March 11. This luncheon, which has become an annual institution, is normally attended by 50 to 75 members.

The proceedings of the Louisville convention are now in the hands of the printer and it is expected that they will be distributed to the members during the month.

Maintenance of Way Club of Chicago

Fifty members and guests attended a meeting at the Auditorium hotel on Wednesday evening, February 18, when R. N. Wade, engineer maintenance of way of the Chicago Rapid Transit, gave a talk on track maintenance from the standpoint of the urban transportation line carrying a closely spaced traffic. Mr. Wade's talk was supplemented by motion-sound pictures of street transportation throughout the world presented under the auspices of the Chicago Surface Lines.

Metropolitan Track Supervisor's Club

Thirty-seven members and guests were present at the meeting on February 19, at which a paper on the safe operation of motor cars was presented by a committee of which A. A. Cross, division engineer, New York, New Haven & Hartford, was chairman.

The next meeting will be held on April 23, at 6:30 p. m., at Keen's Chop House, 72 West Thirty-Sixth street, New York. Papers on "Six-Hole Versus Four-Hole Joints" and "When and How Often Should Track Bolts Be Tightened" will be presented by a committee of which F. J. Meyer, assistant engineer maintenance of way, New York, Ontario & Western, is chairman.

International Track Supervisors' Club

The International Track Supervisors' Club met on February 19, at the Hotel Statler, Buffalo, N. Y. The two items of most interest at the meeting were papers on "Manganese Switch Points" by D. F. Hilton, Ramapo Ajax Corporation, and on "The Maintenance of Frogs and Switch Points," by E. P. Safford, supervisor of track, New York Central.

American Railway Engineering Association

The thirty-second annual convention will be held in the Palmer House, Chicago, on March 10 and 11, two days instead of the usual three-day meeting.

In a letter addressed to the members, G. D. Brooke, president of the association, offers the following comments on the change in the convention arrangements:

"Every effort will be used to make the convention an interesting and successful one. The amount of printed matter appearing in the current bulletins has been materially reduced, but the work of the committees during the past year has been on the usual high plane, and their reports contain conclusions and supporting material which justify thorough consideration on the part of the convention. It is felt that this can be done within the allotted time provided the discussions are well thought out, are addressed to the point under consideration, and unnecessary comments upon unimportant details are avoided as far as practicable."

The program is as follows:

Tuesday morning—9:30 A. M.

President's address
Reports of secretary and treasurer
Reports of Committees on:
- Standardization
- Stresses in Railroad Track
- Uniform General Contract Forms
- Clearances
- Electricity

On the Colorado & Southern in New Mexico

Tuesday afternoon—2 P. M.

Grade Crossings
Ballast
Ties
Wood Preservation
Iron and Steel Structures
Wooden Bridges and Trestles
Maintenance of Way Work Equipment

Tuesday evening—7:30 P. M.

Yards and Terminals
Shops and Locomotive Terminals
Buildings
Roadway

Wednesday morning—9:30 A. M.

Signals and Interlocking
Rules and organization
Records and Accounts
Masonry
Rivers and Harbors
Economics of Railway Location
Economics of Railway Labor

Wednesday afternoon—2 P. M.

Water Service and Sanitation
Rail
Track
Economics of Railway Operation
Closing business

As a part of the report of the Roadway committee, Dr. G. E. Ladd, consulting engineer geologist, Washington, D. C., will give an illustrated talk on drainage.

The personnel of the joint committee of representatives of the railways and rail manufacturers which is to undertake a research on the causes and possible elimination of transverse fissures has been selected. F. W. Wood, Baltimore, Md., will be chairman and the members representing the Rail committee are: Earl Stimson, chief engineer maintenance, Baltimore & Ohio, Vice-Chairman; A. F. Blaess, chief engineer, Illinois Central; C. B. Bronson, assistant inspecting engineer, New York Central; W. C. Cushing, engineer standards, Pennsylvania; G. J. Ray, chief engineer, Delaware, Lackawanna & Western; and W. C. Barnes, engineer of tests for the Rail committee. The manufacturers are represented by the Manufacturers' Technical Committee, the personnel of which is as follows: John Brunner, manager department of metallurgy, Illinois Steel Company; E. F. Kenney, metallurgical engineer, Bethlehem Steel Company; L. S. Marsh, manager department of inspection and metallurgy, Inland Steel Company; C. F. W. Rys, metallurgical engineer, Carnegie Steel Company; and J. S. Unger, manager central research bureau, Carnegie Steel Company. The Bethlehem, Carnegie, Inland and Illinois steel companies will each roll 1,250 tons of 130-lb. rail for service tests, and the Colorado Iron & Fuel Company, the Tennessee Coal, Iron & Railroad Company and the Inland and Illinois mills will each roll 1,250 tons of 110-lb. rail for the same purpose. These rollings will be made in accordance with accepted mill practice, but special pains are to be taken to insure that every feature of the mill practice and a complete history of every heat are recorded. The research will be carried out in the field and in the laboratory of the University of Illinois.

The Positive Stop

Against Rail Movement

YOU will no longer have to worry about your track walking away. The UNIT ANTI-CREEPER has definitely solved this problem.

The UNIT ANTI-CREEPER will not loosen and become inoperative when the rails slack back. It will carry the tie in any kind of ballast without slipping.

It is easily applied and removed—no injurious hammering required. It cannot be overdriven. It can be knocked off and reapplied without any loss in resiliency.

A test will convince you.

Space No. 87

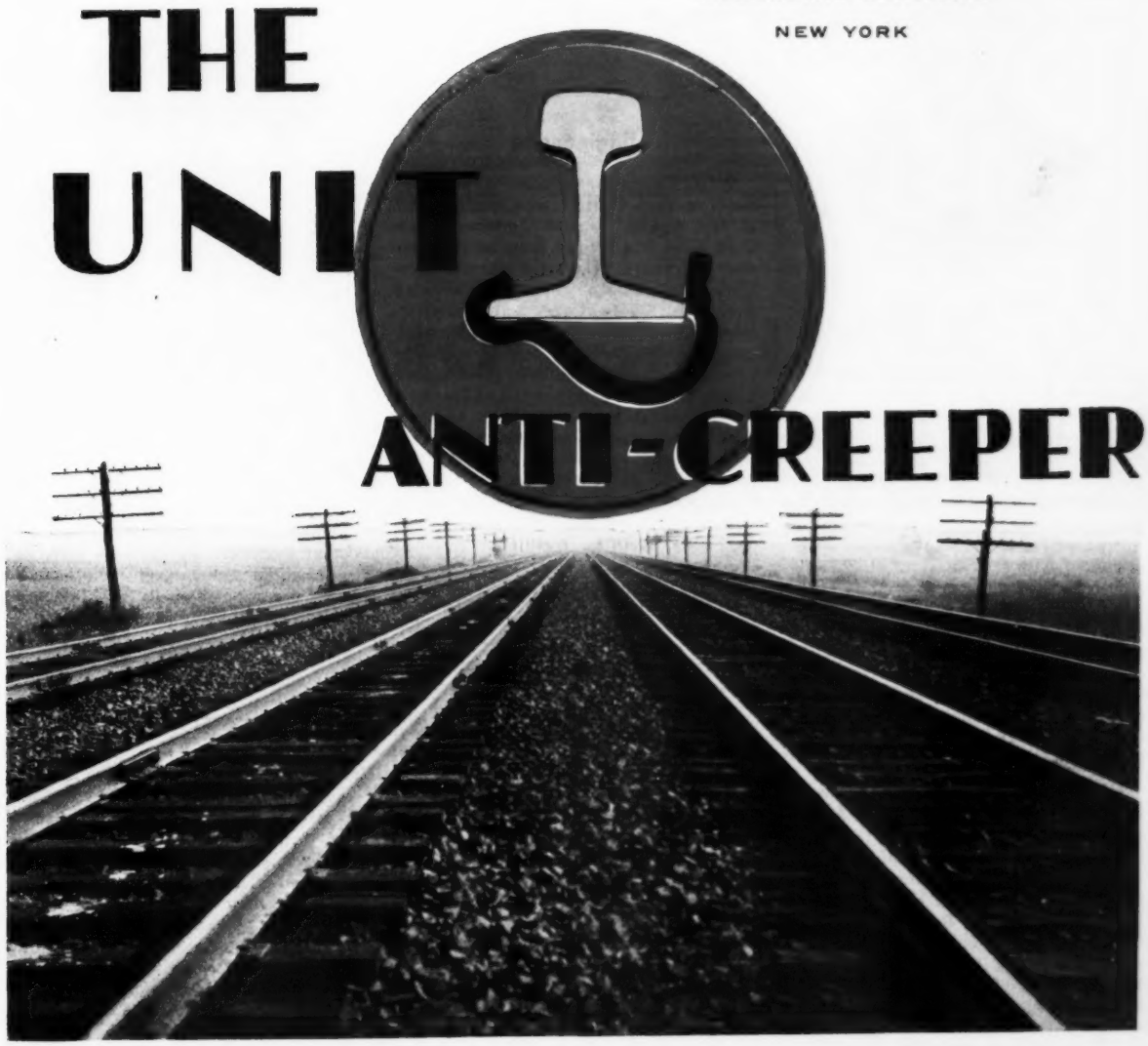
National Railway Appliance Association Exhibit

EXECUTIVE AND MAIN OFFICE

THE CREEPCHECK CO., INC.

WOOLWORTH BUILDING

NEW YORK



PERSONAL MENTION

General

William E. Smith, formerly a track supervisor and roadmaster on the Louisville & Nashville, whose promotion to general manager of that road, with headquarters at Louisville, Ky., was noted in the February issue, was born on September 13, 1868, at Georgetown, Ga. He obtained his first railway experience as a water boy on the Louisville & Nashville at the age of 12 years, later being advanced successively through the positions of messenger and assistant agent. In 1885, he went with the maintenance of way department as a trackman, being

William E. Smith

promoted to track foreman in 1887. He served in this position and as roadmaster's clerk until 1890, when he was made supervisor of construction. A year later Mr. Smith was appointed track supervisor and in 1895 he was promoted to roadmaster, serving in this position for nine years. At the end of that time he was promoted to assistant division superintendent with headquarters at Birmingham, Ala., and in 1912 he went to Louisville as superintendent of construction. In 1915, Mr. Smith was promoted to division superintendent with headquarters at Birmingham, being further advanced to assistant general manager with headquarters at Louisville in 1924. His promotion to general manager became effective on January 16.

J. C. White, whose promotion from division engineer of the New York division of the Pennsylvania, to superintendent of the Monongahela division of that road was noted in the February issue, was born on June 9, 1888, at Huntingdon, Pa. He graduated from Pennsylvania State College in 1911, and entered railroad service with the Pennsylvania on June 17, 1912, as a chainman in the maintenance of way department of the Tyrone division. On October 1, 1912, he was promoted to rodman, and in May, 1916, he was assigned a position in the assistant engineer's office at Altoona, Pa. In October, 1916, he was promoted to transitman and later to assistant supervisor in which position he served from May, 1917 to November, 1919, on the Tyrone, Allegheny, Pittsburgh and Philadelphia divisions, respectively. In November, 1919, Mr. White was assigned to the Maryland division as assistant master carpenter, and in March, 1921, he was transferred to the Philadelphia Terminal division as assistant supervisor, being transferred to the Baltimore division in May, 1922. In July, 1922, he was promoted to track supervisor and served in this position on the Schuylkill and Middle divisions until January, 1928, when he was promoted to division engineer on the Richmond division, later being transferred to the Logansport and New York divisions, respectively. His promotion to superintendent with headquarters at Uniontown, Pa., became effective on January 16.

Engineering

W. J. Thornton, terminal engineer on the New York Central, with headquarters at the Grand Central Terminal, New York City, has retired from active duty after 27 years of service on the New York Central. Mr. Thornton graduated from All Saints College, Manchester, England, and after a varied engineering career, which included service with the French Expedition building the Panama Canal, he entered the service of the New York Central as a draftsman in 1903. Two years later, he was made assistant engineer and in 1906 he was appointed assistant designing engineer. In December of that year he was promoted to designing engineer, which position he held until 1922 when he was made terminal engineer.

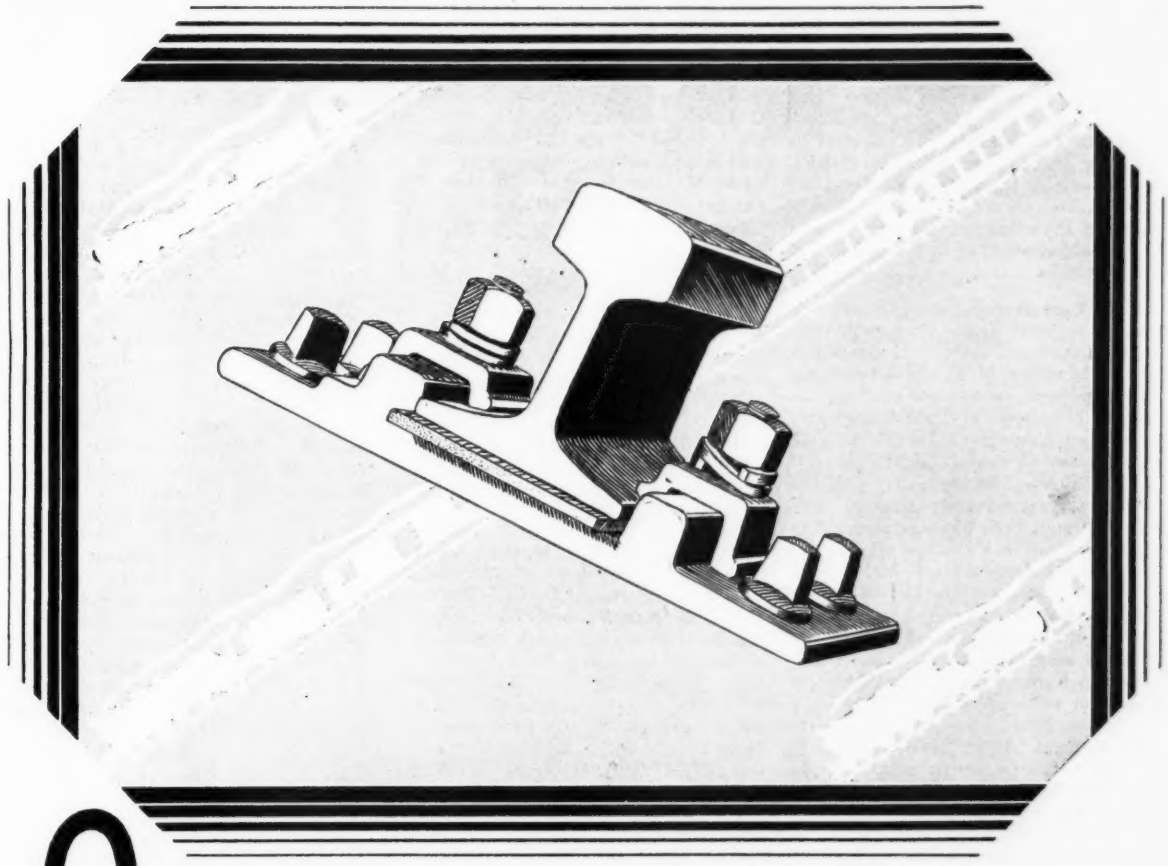
N. R. Hunter, track supervisor on the Philadelphia Terminal division of the Pennsylvania, with headquarters at West Philadelphia, Pa., has been promoted to division engineer of the Cumberland Valley division, with headquarters at Chambersburg, Pa., succeeding **Spencer Danby,** who has been transferred to the Atlantic division, with headquarters at Camden, N. J. Mr. Danby replaces **H. W. Anderson,** who has been transferred to the Middle division with headquarters at Altoona, Pa., where he succeeds **J. F. Swenson,** who has been transferred to the New York division with headquarters at Jersey City, N. J. Mr. Swensen takes the place of **J. C. White,** whose promotion to division superintendent was noted in the February issue and whose sketch appears elsewhere in these columns. **J. L. Huron,** supervisor on the Pittsburgh division, with headquarters at Trafford, Pa., has been promoted to assistant division engineer on the New York division, with headquarters at Jersey City, N. J.

F. H. Hibbard, whose appointment as chief engineer of the Quebec Central, was noted in the February issue, was born on August 9, 1888, at Ottawa, Ont. Mr. Hibbard entered railway service in October, 1907, as a chainman on location with the National Transcontinental (now part of the Canadian National). Two months later he was appointed a rodman at St. Malachie County, Que. In August, 1908, he was promoted to leveller on location and in November of that year he became assistant engineer on construction at St. Anselme, Que. From 1909 to 1911, he served as an assistant engineer

F. H. Hibbard

on the construction of the Quebec Bridge yard and of the Quebec terminals. From 1911 to 1912, he served as resident engineer and in the latter year he became a partner in the firm of Thomas & Hibbard, contractors. From April to May, 1913, Mr. Hibbard was engaged on construction work with the Canadian Pacific and from May to June, 1913, he was engineer on construction of the Lake Erie & Northern (now part of the C. P. R.) In June, 1913, he entered the service of the Quebec Central as engineer in charge of construction and in 1916 was appointed assistant engineer. In January, 1924, he was promoted to engineer maintenance of way. Four years later, Mr. Hibbard became engineer, taking over the duties of chief engineer, general roadmaster and superintendent of bridges and buildings, and of engineer maintenance of way, which position he held until his recent appointment as chief engineer.

A. E. Stewart, roadmaster on the Medicine Hat division of the Alberta district of the Canadian Pacific, with headquarters at Bassano, Alta., has been promoted to division engineer of the Winnipeg Terminal division of the Manitoba district, with headquarters at Winnipeg, Man., succeeding **C. S. Moss,** who has retired after 40 years of service. **John Robertson,** division engineer of the Cranbrook division of the British Columbia district, with headquarters at Cranbrook, B. C., has been transferred to the newly created Kettle Valley division (formerly



ALONG MODERN LINES...

GEO, a modern type of railroad track construction, not only provides for the heavier loads and increased speed of transportation today, but anticipates track requirements for many years to come. 7900 miles of G E O track have already been laid in Germany and the modernization of their main lines will be completed within the next few years. They then plan to run trains at an average speed of 90 miles per hour! Other European countries, quick to follow Germany's lead, are rushing the installation of G E O that they may be abreast of the times. Here in America, test sections have been installed and many more are now being planned.

Greater safety, a radical reduction in maintenance costs, smooth and practically noiseless track, longer life of rails and ties . . . . these are chief among the many advantages of G E O. A test section will convince you of its outstanding superiority.

Descriptive literature will be sent at your request, and Carnegie engineers are at your service to discuss with you this important new development.

GEO TRACK CONSTRUCTION

CARNEGIE STEEL COMPANY - PITTSBURGH

Subsidiary of United States Steel Corporation

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the Kettle Valley Railway) with headquarters at South Penticton, B. C. succeeding **T. J. Behan,** whose appointment as roadmaster is noted elsewhere in these columns. The position of division engineer at Cranbrook has been abolished. **W. C. E. Robinson,** division engineer of the Bruce division of the Ontario district, with headquarters at Toronto, Ont., has been transferred to the Trenton division with the same headquarters, succeeding **L. S. Rudder,** who has in turn succeeded Mr. Robinson.

V. H. Carruthers, whose promotion to division engineer of the Portage division of the Canadian Pacific, with headquarters at Winnipeg, Man., was noted in the February issue, was born on June 27, 1893, at Harcourt, N. B., and graduated from the University of Toronto in 1923. He commenced railway service in 1913 on preliminary location work with the Canadian National and remained with this road until 1916, when he resigned to serve overseas with the Canadian army. On returning from the war in 1919, Mr. Carruthers became a transitman on the Canadian Pacific and served in this position on the Saskatoon and Moose Jaw divisions until 1920, when he was transferred to Kenora, Ont. In 1925, he was appointed extra gang foreman on new line construction, being promoted to roadmaster at Virden, Man., in 1925. In February, 1926, he was transferred to the Fort William, Ont., terminals, and from July of the same year until may, 1927, he served as roadmaster on the Kettle Valley (part of the C. P. R.), with headquarters at Princeton, B. C. On the latter date, Mr. Carruthers was transferred to Weyburn, Sask., where he remained until his recent promotion to division engineer, which became effective the latter part of last year.

Track

J. Bain, roadmaster on the Moose Jaw division of the Saskatchewan district of the Canadian Pacific, with headquarters at Assiniboia, Sask., has been transferred to the Regina division of the same district with headquarters at Estevan, Sask., where he succeeds **G. Johnson,** who has been transferred to Regina, Sask., on the same division. Mr. Johnson succeeds **L. B. Copeland,** retired. **J. W. Slater,** roadmaster on the Moose Jaw division, with headquarters at Outlook, Sask., has been transferred to Assiniboia, to replace Mr. Bain. **R. F. P. Bowman,** a transitman at Lethbridge, Alta., has been promoted to roadmaster on the Medicine Hat division of the Alberta district, with headquarters at Empress, Alta., where he succeeds **N. Bassarab,** who has been transferred to Bassano, Alta., on the same division. Mr. Bassarab succeeds **A E. Stewart,** whose promotion to division engineer is noted elsewhere in these columns. **T. J. Behan,** division engineer on the Kettle Valley (now the Kettle Valley division of the C. P. R.), with headquarters at South Penticton, B. C., has been appointed roadmaster on the C. P. R., with headquarters at Sirdar, B. C. **T. W. Creighton,** a transitman with headquarters at Kenora, Ont., has been promoted to roadmaster on the Brandon division of the Manitoba district, with headquarters at Virden, Man., succeeding **G. Larson,** who has been transferred to the Saskatoon division of the Saskatchewan district, with headquarters at Wilkie, Sask. Mr. Larson replaces **A. Hart,** who has been transferred to the Regina division of the same district, with headquarters at Regina, where he succeeds **G. Sandstrom,** who has retired. **A. Drowley** has been appointed roadmaster on the Lethbridge division of the Alberta district, with headquarters at Consul, Sask., where he succeeds **J. Charyk,** who has been transferred to Lethbridge, Alta. on the same division.

R. A. Sharood, roadmaster on the Yellowstone division of the Northern Pacific, with headquarters at Glendive, Mont., has been transferred to the Fargo division, with headquarters at Fargo, N. D., succeeding **R. E. Mattson,** who has been assigned to other duties. The position of roadmaster at Glendive has been abolished. **Nels Vordahl,** roadmaster on the Montana division, with headquarters at Laurel, Mont., has been assigned to other duties and his position abolished. **F. C. Welch** roadmaster on the Rocky Mountain division, with headquarters at Helena, Mont., has also been assigned to other duties and his position abolished. **Dan McLaughlin,** roadmaster on the Pasco division, with headquarters at Pasco, Wash., has been granted a 60-day leave of absence.

Jack Stewart, whose promotion to roadmaster on the Shasta division of the Southern Pacific, was noted in the December issue, was born on May 7, 1898, at Denison, Iowa, and graduated from the public schools of Medina, N. D. He entered railway service in March, 1919, as a levelman on the Shasta division of the Southern Pacific and has been with this company continuously to the present. He was advanced successively through the positions of transitman, draftsman and assistant engineer on the same division, with headquarters at Dunsmuir, Cal., being appointed roadmaster, with headquarters at Alturas, Cal., late last year.

William Tristler, track foreman on the St. Louis-San Francisco, has been appointed roadmaster, with headquarters at Pittsburg, Kan., succeeding **H. W. Cooper,** who has been transferred to Ft. Scott, Kan., to replace **W. I. Elliott,** who has retired after 46 years of service with the Frisco. Mr. Tristler was born on July 15, 1872, at Columbus, Ind., and commenced railway service in 1894 as a trackman on the Frisco, being promoted to track foreman on May 27, 1895. He retained this position continuously until October 16, 1920, when he was promoted to roadmaster, serving in this position until December 4, 1928. On that date Mr. Tristler again assumed the position of track foreman, which position he held until his recent promotion to roadmaster, effective January 1.

Changes on the Pennsylvania

L. L. Harding, Jr., assistant on the engineer corps of the Philadelphia division of the Pennsylvania, with headquarters at Lancaster, Pa., has been promoted to assistant supervisor on the Middle division at Osceola, Pa., where he succeeds **R. P. Bell,** who has been transferred to the Williamsport division, at Williamsport, Pa. Mr. Bell succeeds **P. W. Early,** who has been transferred to the Middle division with headquarters at Newport, Pa., succeeding **P. M. Roeper,** who has been promoted to supervisor on the Sunbury division, at Sunbury, Pa., succeeding **H. D. Kruggel,** who has been transferred to the Cumberland Valley division, with headquarters at Chambersburg, Pa. Mr. Kruggel replaces **T. H. Thomas,** who has been transferred to the Schuylkill division at Norristown, Pa., succeeding **G. M. Hain,** who has been transferred to the Atlantic division with headquarters at Atlantic City, N. J., to replace **H. O. Gray.** Mr. Gray has been transferred to the Delmarva division, with headquarters at Clayton, Del., succeeding **J. J. Clutz,** who has been transferred to the Baltimore division, at Washington, D. C., where he relieves **A. W. Preston, Jr.,** who has been transferred to the Philadelphia Terminal division at West Philadelphia, Pa. **Lewis A. Evans,** assistant supervisor on the Baltimore division, with headquarters at Baltimore, Md., has been transferred to the Middle division at Tyrone, Pa., succeeding **J. B. Jones,** who has been promoted to supervisor on the Baltimore division with headquarters at Baltimore, Md.

C. B. Holley, assistant on the engineer corps, with headquarters at Middletown, Pa., has been promoted to assistant supervisor on the Middle division, with headquarters at Hollidaysburg, Pa., to succeed **E. W. Speidel,** who has been transferred to the Cumberland Valley division, with headquarters at Chambersburg, Pa., where he succeeds **L. G. Walker, Jr.,** who has been transferred to the Atlantic division, with headquarters at Camden, N. J. Mr. Walker replaces **W. H. Heims,** who has been transferred to the Philadelphia division, with headquarters at Lancaster, Pa., to succeed **C. R. Uitts,** who has been transferred to the Philadelphia Terminal division, with headquarters at South Philadelphia, Pa., where he relieves **A. J. Greenough,** who has been transferred to the Middle division, at Lewistown, Pa. Mr. Greenough, in turn, succeeds **H. F. Gette,** who has been transferred to the Philadelphia division, at Harrisburg, Pa., succeeding **J. T. Honker,** who has been transferred to the Maryland division, at Perryville, Pa., where he replaces **R. P. Hebard,** who has been transferred to the Philadelphia Terminal division, at West Philadelphia, Pa. **A. P. Talbot,** supervisor on the Maryland division, with headquarters at Media, Pa., has been transferred to the Cumberland Valley division, with headquarters at Chambersburg, Pa., to succeed **G. A. Williams,** who has been transferred to the Atlantic division, with headquarters at Camden,

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N. J., succeeding **H. H. Pevler,** who has been transferred to the Philadelphia division, with headquarters at Middletown, Pa., where he succeeds **L. E. Gingerich,** who has been transferred to the Baltimore division, with headquarters at Baltimore. Mr. Gingerich replaces **R. B. Harris,** who has been transferred to the Sunbury division, at Shamokin, Pa., succeeding **P. W. Triplett,** who has been transferred to the Maryland division, with headquarters at Media, Pa., to succeed Mr. Talbot.

Abram Fulkerson, assistant on the engineer corps of the Eastern division of the Central region of the Pennsylvania, has been promoted to assistant supervisor on the Buffalo division, succeeding **C. R. Sanders,** who has been transferred to the Pittsburgh division, with headquarters at Johnstown, Pa. Mr. Sanders succeeds **J. C. Buzard,** who has been promoted to supervisor on the Buffalo division with headquarters at East Aurora, N. Y., succeeding **J. P. Newell,** who has been transferred to the Erie & Ashtabula division with headquarters at New Castle, Pa. Mr. Newell succeeds **R. H. Meintel,** who has been transferred to the Panhandle division, with headquarters at Carnegie, Pa., where he succeeds **D. M. Howard,** whose promotion to assistant division engineer was noted in the February issue.

Bridge and Building

Charlie L. Marks, assistant supervisor of bridges and buildings on the Richmond division of the Chesapeake & Ohio, with headquarters at Richmond, Va., has been promoted to supervisor of bridges and buildings on the same division, and with the same headquarters, succeeding **Isaac Garrison,** whose death was noted in the February issue. Mr. Marks has been succeeded as assistant supervisor of bridges and buildings by **Herbert T. Bishop.** Mr. Marks entered the service of the C. & O. on April 18, 1897, in the track department, and in 1900, he was made a foreman. In November, 1902, he was appointed tie and lumber inspector on the Richmond and Clifton Forge divisions, and on November 1, 1921, he was appointed assistant supervisor of bridges and buildings, the position he was holding at the time of his recent promotion.

Obituary

Harry Hawgood, formerly a railroad engineer in this country and in South Africa and at one time chief engineer of the San Pedro, Los Angeles & Salt Lake (now the Los Angeles & Salt Lake), died at Los Angeles, Cal., on January 3, at the age of 78 years.

Thomas W. Flannagan, assistant to the vice-president and general manager of the Minneapolis, St. Paul & Sault Ste. Marie, with headquarters at Minneapolis, Minn., and formerly track and maintenance of way engineer of that road, died at his home in St. Paul on January 30, after an illness of nearly two years. Mr. Flannagan was born in England in 1863. He was educated in a grammar school at Manchester, England, and graduated from Victoria University in 1884. In 1887 he entered railway service as a rodman on the Northern Pacific, becoming a resident engineer on the Soo Line five years later. In 1898 he was advanced to track and maintenance of way engineer, then being appointed storekeeper in 1901, with headquarters at Minneapolis, Minn. Mr. Flannagan was promoted to general storekeeper in 1909, a position he held until his promotion to assistant to the general manager in 1920. He was appointed assistant to the vice-president and general manager in 1926.

B. T. McIver, retired superintendent of bridges and buildings of the Duluth & Iron Range, died at his home in Long Beach, Cal., on February 3. Mr. McIver was a charter member of the American Railway Bridge and Building Association.

Richard Montfort, consulting engineer of the Louisville & Nashville, with headquarters at Louisville, Ky., who died at Atlantic City, N. J., on February 7, had been in the service of that company for more than 50 years. He was born in

Richard Montfort

Ireland on March 4, 1855, and graduated from the Royal College of Science at Dublin in 1876. Mr. Montfort obtained his first railway experience in July, 1880, when he was appointed bridge engineer of the Louisville & Nashville. Three years later he became resident engineer in charge of roadway, bridges and buildings, then being promoted to chief engineer in 1887. He was appointed consulting engineer on January 1, 1905.

George H. Nickerson, chief engineer of the Yosemite Valley, with headquarters at Merced, Cal., died in a hospital at San Francisco, Cal., on January 15, following a major operation. Mr. Nickerson was born on March 23, 1863, at Lebanon, Ore., and entered railway service in April, 1884, as a rodman on the Oregon Pacific (now part of the Southern Pacific). Later he served subsequently as a roadmaster and division engineer on the Union Pacific, as a division roadmaster on the Gulf, Colorado & Santa Fe at Cleburne, Tex., and as a general foreman of bridges and buildings on the Atchison, Topeka & Santa Fe at Fresno, Cal. In November, 1906, he was appointed chief engineer of the Yosemite Valley at Merced, where he remained until October, 1917, when he resigned to enter private practice as a civil engineer. Mr. Nickerson re-entered the service of the Yosemite Valley as chief engineer on January 1, 1922, a position he occupied until his death.

Eugene M. Weaver, formerly engineer maintenance of way of the Long Island Railroad, and at one time signal engineer of that road, died on January 22 at Rock Glen, Pa. Mr. Weaver was born at Danville, Pa. on April 6, 1859, and started his railroad career on September 15, 1878, as

Eugene M. Weaver

a clerk and telegraph operator on the Pennsylvania, at Riverside, Pa. From 1882 until 1903, Mr. Weaver served in various positions in the operating department of the Pennsylvania and in the electrical and mechanical departments of the New York Central & Hudson River, holding successively the positions of chief electrician and superintendent of signals. On June 1, 1903, he went with the Lond Island as signal engineer, and in this capacity he was in charge of the first electrification work on that road. On July 20, 1911, he was promoted to engineer maintenance of way, and after more than 15 years active service in this capacity, he was retired under the pension rules of the company on November 1, 1926.

Warren H. Knowlton, formerly assistant chief engineer of the Chicago Great Western, and at one time principal assistant engineer of the New York Central, whose death was announced in the February issue, retired in 1907 after a long career during which he was engaged in railway engineering and construction work on a large number of roads, principally in the Northwest. He was born on April 29, 1847, and entered railway service in 1870 as a rodman on the Iowa Falls & Sioux City and the Cedar Falls & Minnesota (now part of the Illinois Central). From this date until 1899, Mr. Knowlton served in impor-

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tant engineering and construction positions on various roads, some of which are now parts of the Chicago, Milwaukee, St. Paul & Pacific, the Illinois Central, the Great Northern and the Chicago Great Western. Twice during this period he was city engineer of Dubuque, Iowa, serving in this position for a total of nine years. In 1899, he was appointed assistant chief engineer of the Great Western, which position he held until 1903, when he went with the New York Central & Hudson River (now the New York Central) as principal assistant engineer. Later Mr. Knowlton also served as chief engineer of the Electric Zone. He remained with the New York Central until his retirement.

Edward Gagel, formerly chief engineer of the New York, New Haven & Hartford, died at his home at West Haven, Conn., on February 12, of heart disease. Mr. Gagel was born on October 25, 1858 at Mount Hope, N. Y., and received his education in the public schools at Mount Hope and Cooper Institute, New York. He entered railroad service with the Brooklyn, Flatbush & Coney Island

Edward Gagel

Railroad in December, 1877, at the age of 19, and in April, 1879, he became assistant engineer for the Metropolitan Elevated. Early in the following year he spent a few months as a draftsman for the West Side & Yonkers (now part of the New York Central) and in March, 1880, he went with the New York & New England (now part of the New Haven) as leveler and draftsman. During the year 1882, he served successively as a transitman for the Erie & Wyoming Valley (now part of the Erie), an engineer for the Pittsburgh, McKeesport & Youghiogheny (now part of the Pittsburgh & Lake Erie) and a draftsman for the New York Central. In December, 1882, he entered the service of the New York, New Haven & Hartford as a draftsman. In November, 1885, he was appointed assistant engineer, and in June, 1891, became district engineer. Nine years later he again became assistant engineer in July, 1900. In June, 1904, he was made principal assistant engineer, and in October 1905, was appointed chief engineer for the system. He retired on October 1, 1929.

SUPPLY TRADE NEWS

General

The Truscon Steel Company, Youngstown, Ohio, has moved its Minneapolis, Minn., offices from 611 Metropolitan Bank building to 344 Baker Building.

W. Newton Jeffress, Inc., railway specialties and supplies, has moved his headquarters from the National Press building, to the Woodward building, Fifteenth and H streets, N. W., Washington, D. C.

The Bucyrus-Erie Company, Milwaukee, Wis., has purchased a controlling interest in the **Monighan Manufacturing Company,** Chicago, and will operate the latter as a separate unit under the present management.

The American Hoist & Derrick Company, St. Paul, Minn., the **Dominion Bridge Company, Ltd.,** and the **Dominion Engineering Works, Ltd.,** Montreal, Que., have formed the **Dominion Hoist & Shovel Company, Ltd.,** a subsidiary company, to manufacture and sell the products of the former company in Canada and the British Empire.

A Correction

Fairmont Railway Motors, Inc., desires to correct a statement appearing in its advertisement in the January issue of *Railway Engineering and Maintenance,* wherein Charles Carroll was quoted as saying at the time of laying the cornerstone of the Baltimore & Ohio, "This is my second great step for my country." Mr. Carroll's exact words were, "I consider this among the most important acts of my life, second only to my signing the Declaration of Independence, if even it be second to that."

Personal

Hamilton A. West, vice-president of the International Creosoting and Construction Company, with headquarters at Galveston, Tex., died in that city on February 20.

Ward G. Day, district manager of **Fairmont Railway Motors, Inc.,** Fairmont, Minn., with headquarters at New Orleans, La., has been transferred to 1218 Olive street, St. Louis, Mo., succeeding **Lee R. Payton,** deceased.

C. B. Murphy, special representative of the Diesel engine division of **Fairbanks, Morse & Company,** Chicago, with headquarters at Washington, D. C., has been appointed manager of stationary Diesel engine sales at Chicago.

Roy E. Greenwood, formerly associted with the **Simonds Saw & Steel Company,** has been appointed assistant general manager of sales of the **American Chain Company, Inc.,** and associated companies, Bridgeport, Conn. Mr. Greenwood will have his headquarters at Bridgeport.

Herbert M. Orschel has been appointed field sales manager of the **Aeroil Burner Company, Inc.,** West New York, N. J.

L. R. Conolly, sales engineer of the **MacLean-Fogg Lock Nut Company,** Chicago, has been granted leave of absence to serve as representative of the Department of Exhibits, Chicago World's Fair Centennial Celebration, in 1933.

Chester G. Cummings, for a number of years associated with the New York office of the **Sullivan Machinery Company,** with headquarters at Syracuse, N. Y., has been appointed manager of the branch office in the Rockefeller building, Cleveland, Ohio., succeeding **R. T. Stone,** resigned.

Charles S. Bilyeu has been appointed manager of the structural steel department of the **Robert W. Hunt Company,** Chicago. Mr. Bilyeu will have jurisdiction over the testing and inspection of steel for buildings and bridges in all districts of the organization. He succeeds **W. T. Reeves,** who has been appointed consulting engineer of the structural department. Mr. Bilyeu graduated from the University of Pennsylvania with a degree in civil engineering and obtained his early experience in the structural field with the American Bridge Company. Later he was associated with a number of structural and consulting engineers, having been connected for the last eight years with Sanderson & Porter, New York.

The Bethlehem Steel Company, Bethlehem, Pa., has acquired the business and properties and has assumed the liabilities of the **McClintic-Marshall Corporation,** by the payment of 240,000 shares of its common stock and of $8,200,000 of 4½ per cent serial notes. On the basis of recent quotations the price paid for the McClintic-Marshall properties totals $33,000,000, of which $12,000,000 represents the bonded indebtedness of that company. **G. H. Blakely,** vice-president of the Bethlehem Steel Company, becomes president of the McClintic-Marshall Corporation, other officers of which, including **Edward A. Gibbs,** vice-president in charge of production; **Charles M. Denise,** vice-president in charge of sales; and **E. J. Patterson,** vice-president and treasurer, have been re-elected in similar capacities.

Mr. Blakely was born on April 19, 1865, at Hanover, N. J., and was graduated from Rutgers College in 1884 with the degree of bachelor of science. From 1884 to 1886 he was engaged in field engineering and later served for one year as engineer of the Riverside Bridge Company, Paterson, N. J., and for two years as assistant engineer on the Erie Rail-

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road in charge of bridge construction. In 1890 he became chief engineer of the Passaic Rolling Mill Company and from 1902 until 1905 he served as manager of sales of this company, in which position he also had charge of mechanical engineering. In 1906 he went with the Bethlehem Steel Company on special development work and was appointed manager of the structural steel department in 1908. In 1927 Mr. Blakely was appointed vice-president of the Bethlehem Steel Company, in which position he was in complete charge of the structural steel operations of the company.

G. H. Blakely

Eugene Brandeis, vice-president of the **Lundie Engineering Corporation,** New York, has been elected president of the corporation, to succeed Dr. John Lundie, whose death is noted elsewhere in these columns. Mr. Brandeis' headquarters will continue to be at New York. **L. B. Armstrong,** western manager, has been elected vice-president, with headquarters at Chicago.

Eugene Brandeis

Mr. Brandeis has been connected with the Lundie Corporation since its formation in 1919. Prior to that time he served for a number of years with the Pennsylvania Railroad in its maintenance of way department, at Philadelphia, Pa. He was secretary and treasurer of the Lundie Engineering Corporation to June, 1929, and at that time was elected vice-president, which position he was holding at the time of his recent election to president.

Mr. Armstrong was born at Lauderdale, Miss. He began railway work in 1905 with the Louisville & Nashville as a station agent and telegraph operator, serving consecutively to March, 1908, as operator, agent and cashier. The following month he went with the Birmingham Southern, a subsidiary of the United States Steel Corporation, at Birmingham, Ala., where he served in various capacities. Mr. Armstrong joined the Lundie Engineering Corporation in April, 1919. In May, 1923, he was promoted to western manager, at Chicago, which position he held until his recent election to vice-president.

L. B. Armstrong

William L. Brown, formerly Philadelphia district sales manager for the **Industrial Works,** Bay City, Mich., and its successor, the **Industrial Brownhoist Corporation,** Cleveland, Ohio, has opened an office at 1600 Arch street, Philadelphia, Pa., to act as special agent for the sale of railroad specialties and cranes.

Jesse V. Honeycutt, who has been a sales agent in New York City for frogs, switches and other railroad material, has been appointed manager of sales of frogs and switches for the **Bethlehem Steel Company,** with headquarters at Bethlehem, Pa. He succeeds **Neil E. Salsich,** who has resigned to become vice-president in charge of sales of the **Jeffrey Manufacturing Company,** Columbus, Ohio.

Claus Greve, president of the **Cleveland Pneumatic Tool Company,** Cleveland, Ohio, has been elected chairman of the board; **L. W. Greve,** treasurer, has been elected president; and **John DeMooy** has been elected treasurer. L. W. Greve is also president of its associated companies, the **Champion Machine & Forging Company** and the **Cleveland Rock Drill Company. H. W. Foster,** vice-president, **H. S. Covey,** secretary, and **Arthur Scott,** superintendent of the Cleveland Pneumatic Tool Company, were re-elected and **A. F. Barner** was appointed assistant secretary.

Obituary

Dr. John Lundie, president of the Lundie Engineering Corporation, New York, an eminent engineer and the inventor of the Lundie tie plate and other track fastenings, died on January 9, at his home in New York City, after an illness of several weeks. Dr. Lundie was born on December 14, 1857, at Arbroath, Scotland, and was educated at the University of Edinburgh where he received the degree of bachelor of science in 1880, and that of doctor of science in 1902. From 1873 to 1893, he was engaged in various fields of engineering work, spending several years with railroads in Oregon and Washington. In the latter year he entered private practice as a consulting engineer, in which capacity he investigated and reported on the electrification of the Illinois Central, and also on elevated and underground electrified lines in Boston, Mass., Brooklyn, N. Y., New York and London, England. Dr. Lundie later served as an officer in charge of the Birmingham Southern, and as vice-president and general manager of the Panama-American Corporation in Panama. He reported on the valuation of many railroad properties, enunciated principles of rapid acceleration in railway movement, and developed the Lundie tie plate and rail anchor. He was co-designer of the Lundie-Durham rail section.

John Lundie

Trade Publications

The Smallest Machine.—The Bucyrus-Erie Company, South Milwaukee, Wis., has recently issued a 20-page booklet describing its 1020, ½-cu. yd. convertible machine, which is the smallest of this company's line of excavating equipment. The booklet is attractively illustrated and arranged.

A Convertible Machine.—The Bucyrus-Erie Company, South Milwaukee, Wis., has issued an attractively illustrated booklet of 20 pages giving the details of design, a description of the applications and the specifications for its 1030, ¾-yd. machine, which is convertible to clamshell, lifting crane, shovel, dragline or drag shovel.

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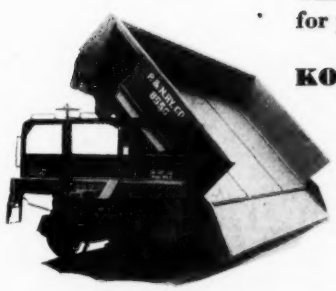

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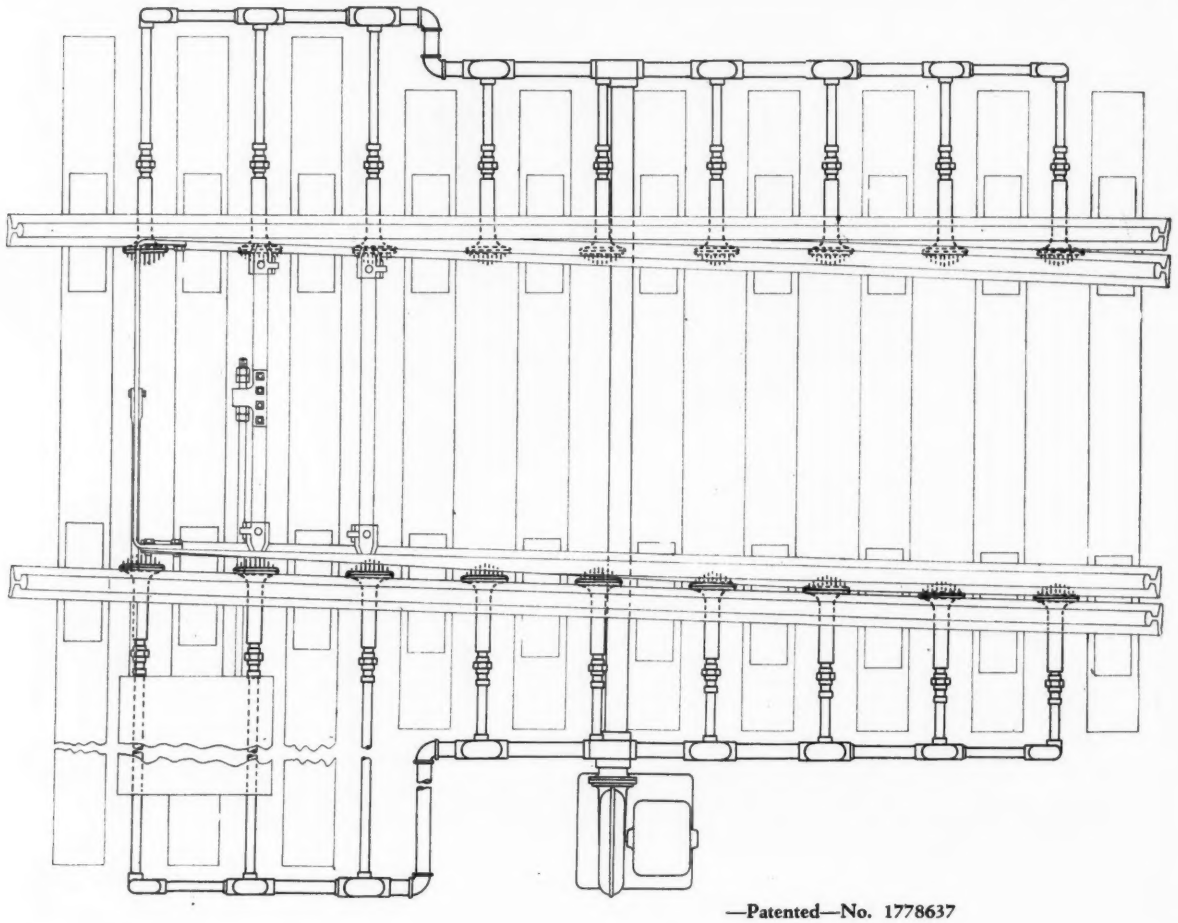

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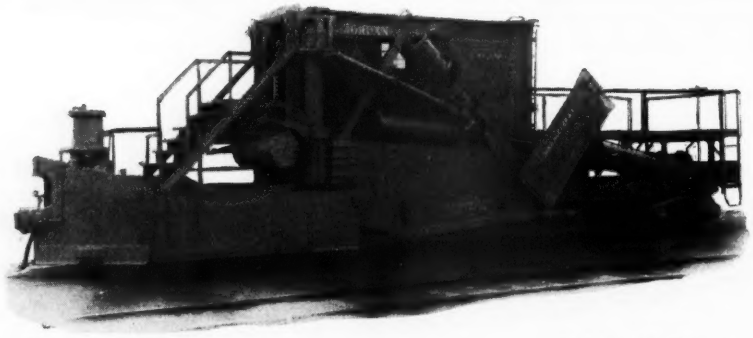

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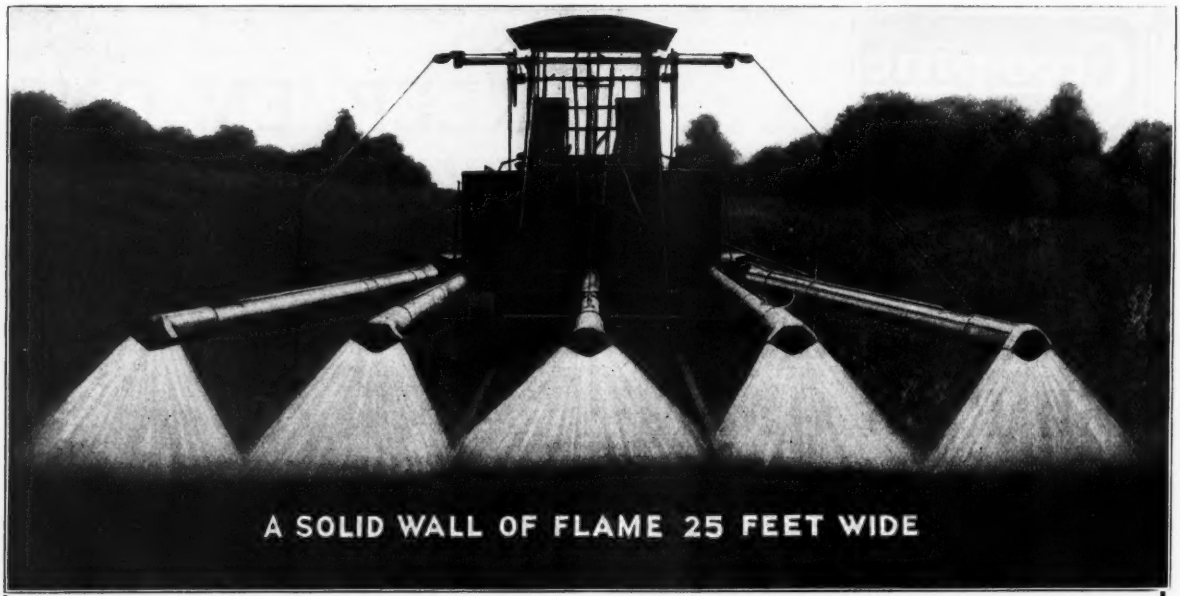

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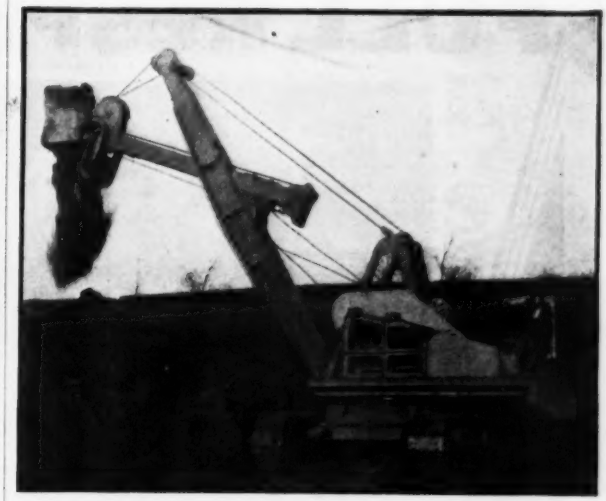

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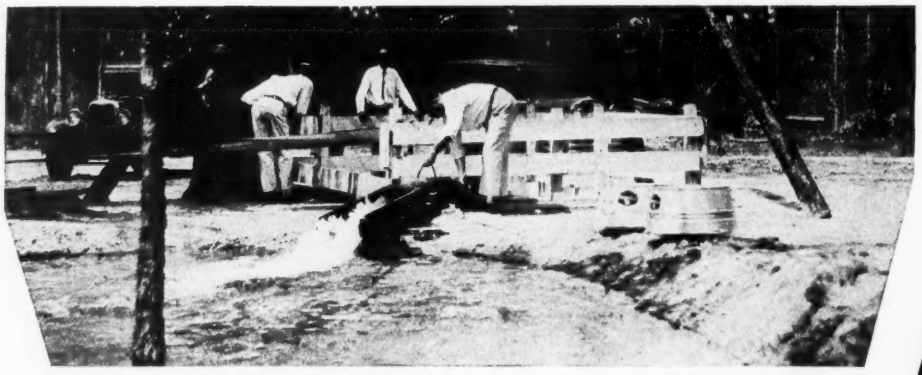

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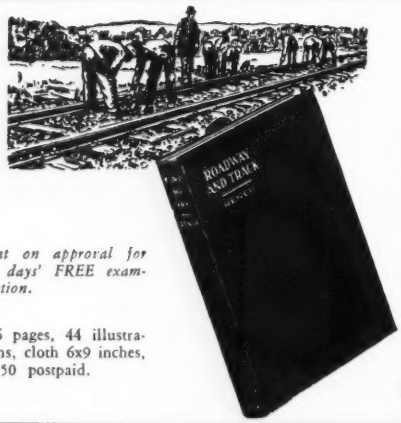

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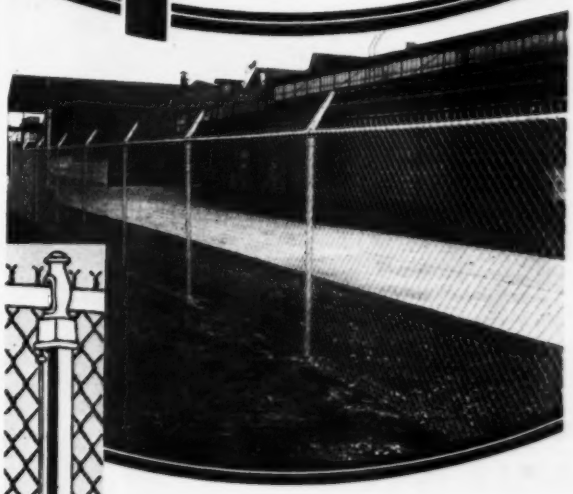

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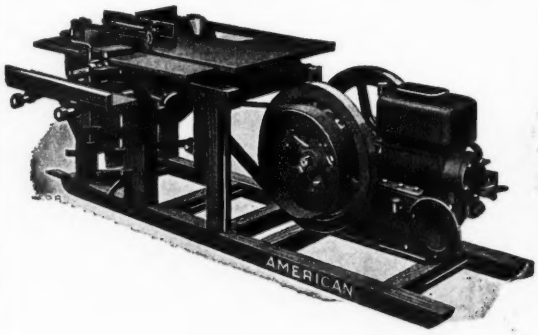

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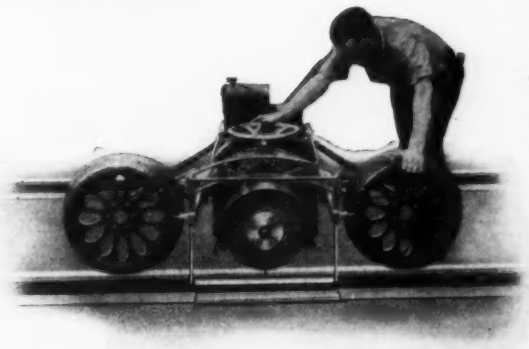

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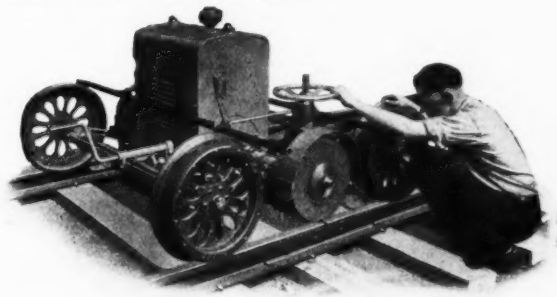

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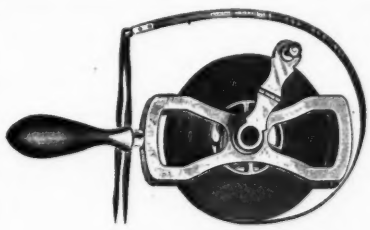

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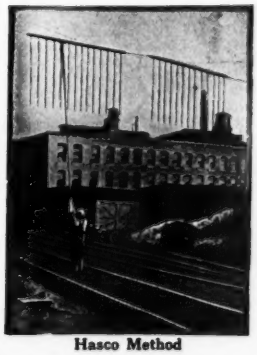

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Magor Car Corp.
Western Wheeled Scraper Co.
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Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Woolery Machine Co.
Cars, Motor
Fairbanks, Morse & Co.
Fairmont Ry. Supply Co.
Woolery Machine Co.
Cars, Section
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Woolery Machine Co.
Cars, Spreader
Bucyrus-Erie Co.
Jordan Co., O. F.
Western Wheeled Scraper Co.
Cars, Velocipede
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Castings
Bethlehem Steel Co.
Timken Roller Bearing Co.
Wharton, Jr. & Co., Inc., Wm.
Catchbasins
Armco Culvert Mfrs. Assn.
Cattle Guards
Fairbanks, Morse & Co.
Cattle Passes
Massey Concrete Products Corp.
Cement Paint
Medusa Cement Co.
Cement, Portland
Medusa Cement Co.
Cement Roofing Tile
Federal-American Cement Tile Co.
Chemical Weed Killer
Chipman Chemical Engineering Co., Inc.
Clay Diggers
Buckeye Traction Ditcher Co.
Clips, Adjustable
Louisville Frog, Switch & Signal Co.
Ramapo Ajax Corp.
Coal Handling Machinery
Buckeye Traction Ditcher Co.
Industrial Brownhoist Corp.
Northwest Engineering Co.
Coaling Stations
Fairbanks, Morse & Co.
Compressors
Ingersoll-Rand Co.
Sullivan Machinery Co.
Compromise Joints
See Joints, Compromise
Concrete Roofing Tile
Federal-American Cement Tile Co.
Concrete Units, Miscellaneous
Federal-American Cement Tile Co.
Massey Concrete Products Corp.
Condensers
Ingersoll-Rand Co.
Corrosion Preventive
Dearborn Chemical Co.
Corrugated Iron
Armco Culvert Mfrs. Assn.
Cranes
Buckeye Traction Ditcher Co.
Bucyrus-Erie Co.
Cullen-Friestedt Co.
Harnischfeger Corp.
Industrial Brownhoist Corp.
Northwest Engineering Co.
Orton Crane & Shovel Co.
Cribbing, Concrete
Federal-American Cement Tile Co.
Massey Concrete Products Corp.
Crossings, Rail
Bethlehem Steel Co.
Louisville Frog, Switch & Signal Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.
Culvert Pipe
Armco Culvert Mfrs. Assn.
Gohi Culvert Mfrs., Inc.
Massey Concrete Products Corp.
Culverts, Corrugated Metal
Armco Culvert Mfrs. Assn.
Gohi Culvert Mfrs., Inc.
Culverts, Paved Invert
Armco Culvert Mfrs. Assn.
Curbing
Massey Concrete Products Corp.
Derails
Q. & C. Co.
Wharton, Jr. & Co., Wm.
Derailing Switches
Louisville Frog, Switch & Signal Co.
Ramapo Ajax Corp.
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Cullen-Friestedt Co.
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Bucyrus-Erie Co.
Harnischfeger Corp.
Industrial Brownhoist Corp.
Jordan Co., O. F.
Northwest Engineering Co.
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American Hoist & Derrick Co.
Buckeye Traction Ditcher Co.
Industrial Brownhoist Corp.
Ditchers, Tile
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Buckeye Traction Ditcher Co.
Bucyrus-Erie Co.
Industrial Brownhoist Corp.
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Richards-Wilcox Mfg. Co.
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Industrial Brownhoist Corp.
Northwest Engineering Co.
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Armco Culvert Mfrs. Assn.
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Armco Culvert Mfrs. Assn.
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Syntron Co.
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Ingersoll-Rand Co.
Sullivan Machinery Co.
Verona Tool Works
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Bethlehem Steel Co.
Ingersoll-Rand Co.
Sullivan Machinery Co.
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Buda Co.
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Fairmont Railway Motors, Co.
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Engines, Oil
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
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Buckeye Traction Ditcher Co.
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Page Fence Association
Q. & C. Co.
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American Steel & Wire Co.
Anchor Post Fence Co.
Bethlehem Steel Co.
Page Fence Association.
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Q. & C. Co.
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Syntron Co.
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Oxweld Railroad Service Co.
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Carnegie Steel Co.
Illinois Steel Co.
Q. & C. Co.
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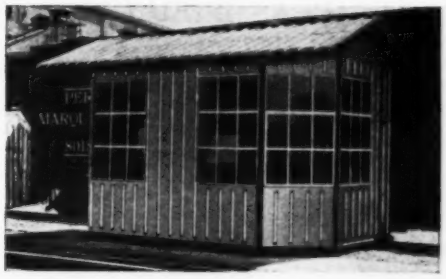
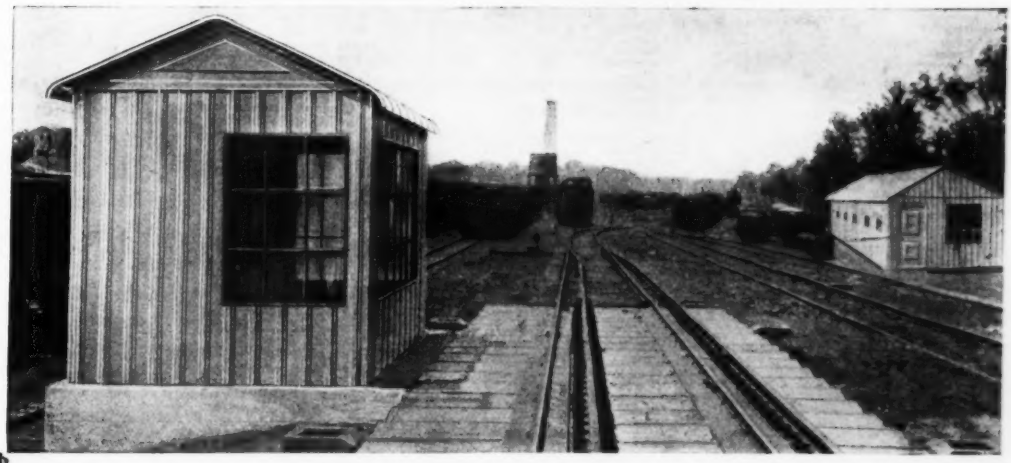
MADE ENTIRELY OF STEEL

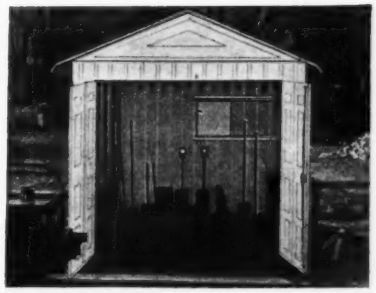
BUTLER

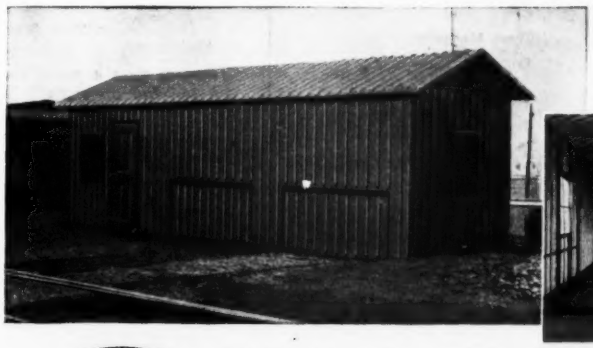




This new book, picturing installations of many types of Butler Ready-made Steel Buildings awaits the request of interested railway officials.

READY-MADE STEEL BUILDINGS





Economical to Acquire . . . Economical to Transport . . . Economical to Install . . . Economical to Maintain

From any standpoint Butler Ready-made Steel Buildings fit into railroad economy programs better than any other fire-safe type of construction.

Their standardized unit design facilitates compact shipping. Ready-made construction simplifies erection to the extent that it can be accomplished by whatever labor crews are at hand. Complete materials in orderly arrangement let installation go forward without interruption. Steel construction offsets the absence of full fire fighting facilities. Permanence is inwrought in both materials and construction—yet the structural design permits enlarging, taking down and re-erecting. These advantages are available in Butler Ready-made Steel Buildings with a lower investment than for any other comparable type of structure. Butler engineering service will supply you with full details and prices on any type and size buildings now under consideration, be they **scale houses, track car houses, material depots, freight depots, car repair shops, material treating plants, machineshops, truck and bus garages, signalmen shelters, transformer or electric power houses, et cetera.**

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Syntron Co.

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Lufkin Rule Co.

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Illinois Steel Company.

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Nordberg Mfg. Co.
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Tampers, Tie
See Tie Tampers.

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Syntron Co.

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Illinois Steel Co.
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Lundie Engineering Corp.

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Louisville Frog, Switch & Signal Co.

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Anchor Post Fence Co.
Bethlehem Steel Co.
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See Preservation, Timber

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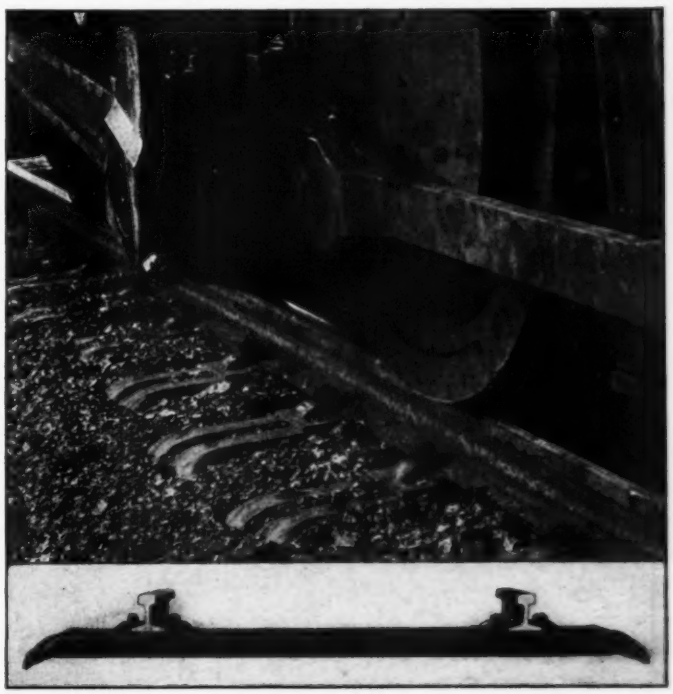
steel ties for heavy-duty locations

THE KEYSTONE No. 17 Steel Tie is particularly suitable for locations where the service is extremely heavy and where the life of wood ties is comparatively short. In yards where heavy loads are moved at slow speeds and the resultant strain on ties and their fastenings is excessive, the use of these steel ties will bring many economies in reduced maintenance. Keystone Steel Ties hold the track true to gage and in alignment, preventing spreading or rolling over of the rails and consequent derailment.



At cinder dumps where wood ties quickly burn out and at water columns where fires are raked with resultant damage to the ties, Keystone Steel Ties provide a permanent track structure.

In sidings and yards, where the wood ties used are often not of the best quality, Keystone Steel Ties may be used to strengthen and reinforce the track. When used in this manner, every third or fourth wood tie is replaced by a steel tie. The steel ties then carry the full strain of the rail fastenings, prevent the spikes from shearing and the wood ties from becoming spike-killed, thus greatly prolonging the life of the wood ties.

The Keystone No. 17 Steel Tie is made of copper-bearing steel. The Tie is channel shaped, with a deep, depressed rib running through the center. The ends are depressed and flared in the shape of a whale-tail, giving the tie a firm grip on the ballast and preventing lateral motion of the track. These ties have rolled steel tie plates welded to the tie and are equipped with heavy rail fastenings. The fastenings are copper-bearing steel and are securely held in position by 1-inch bolts and Unit Lock Nuts. They are applied or removed from the top without moving the tie or disturbing the ballast. A wrench is the only tool required.

For more detailed Information write for folder 200-A

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ALPHABETICAL INDEX TO ADVERTISERS

A

American Fork & Hoe Co. ... 211
American Hoist & Derrick Co. ... 219
American Saw Mill Machinery Co. ... 308
American Steel & Wire Co. ... 291
American Well Works ... 308
Anchor Post Fence Co. ... 305
Armco Culvert Mfrs. Ass'n ... 223

B

Bethlehem Steel Co. ... 196-313
Buckeye Traction Ditcher Co. ... 305
Bucyrus-Erie Co. ... 207
Butler Mfg. Co. ... 311

C

Calcyanide Co. ... 307
Carnegie Steel Co. ... 287
Central Foundry Co. ... 306
Chipman Chemical Engr. Co., Inc. ... 283
Creepcheck Co. ... 285

D

Dearborn Chemical Co. ... 302
DuPont de Nemours & Co., Inc., E. I. ... 220

E

Electric Tamper & Equipment Co. ... 221

F

Fairbanks, Morse & Co. ... 215-216
Fairmont Railway Motors, Inc. ... 190-191
Federal American Cement Tile Co. ... 201

G

Gohi Culvert Mfrs., Inc. ... 218

H

Harnischfeger Corp. ... 199
Hastings Signal & Equipment Co. ... 309
Hunt Co., R. W. ... 300

I

Illinois Steel Co. ... 289
Industrial Brownhoist Co. ... 203
Ingersoll-Rand Co. ... 212-213

J

Jackson Lumber Co. ... 300
Jennison-Wright Co. ... 206
Jordan Co., O. F. ... 302

K

Koppel Industrial Car & Equipment Co. ... 295

L

Layne & Bowler, Inc. ... 306
Louisville Frog, Switch & Signal Co. ... 296
Lowell Wrench Co. ... 227
Lufkin Rule Co. ... 309
Lundie Engineering Corp. ... 189

M

Magor Car Corp. ... 229
Massey Concrete Products Corp. ... 224
Mechanical Mfg. Co. ... 303
Medusa Portland Cement Co. ... 210
Morrison Railway Supply Co. ... 226

N

National Lead Co. ... 192
National Lock Washer Co. ... 315
Nordberg Mfg. Co. ... 209
Northwest Engineering Co. ... 193-194

O

Oliver Iron & Steel Corp. ... 214
Orton Crane & Shovel Co. ... 217
Oxweld Railroad Service Corp. ... 195

P

P. & M. Co. ... 187
Page Fence Ass'n ... 307
Pittsburgh-Des Moines Steel Co. ... 307

Q

Q & C Co. ... 208

R

Rail Joint Co. ... 202
Railway Trackwork Co. ... 309
Ramapo Ajax Corp. ... 230-232
Reliance Mfg. Co. ... 188-297-298
Richards-Wilcox Mfg. Co. ... 299
Ruby Railway Equipment Co. ... 301

S

Simmons-Boardman Publishing Co. ... 304-306-308
Southern Wood Preserving Co. ... 303
Sperry Products, Inc. ... 205
Sullivan Machinery Co. ... 204
Syntron Co. ... 225

T

Timken Roller Bearing Co. ... 316

U

U. S. Graphite Co. ... 222

V

Verona Tool Works ... 197

W

Western Wheeled Scraper Co. ... 198
Wharton, Jr. & Co., Wm. ... 200
Woodings Forge & Tool Co. ... 293
Woolery Machine Co. ... 304